



Bundesministerium
für Wirtschaft
und Klimaschutz

Update of the integrated national energy and climate plan

Federal Republic of Germany – August 2024

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Update of the integrated national Energy and Climate Plan

In accordance with Regulation (EU) 2018/1999 of the European Parliament and of the Council of 11 December 2018 on the Governance of the Energy Union and Climate Action, amending Regulations (EC) No 663/2009 and (EC) No 715/2009 of the European Parliament and of the Council, Directives 94/22/EC, 98/70/EC, 2009/31/EC, 2009/73/EC, 2010/31/EU, 2012/27/EU and 2013/30/EU of the European Parliament and of the Council, Council Directives 2009/119/EC and (EU) 2015/652 and repealing Regulation (EU) No 525/2013 of the European Parliament and of the Council

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2021/1119“381

Maßnahmen zur Umsetzung des Art. 8 der Richtlinie EU 2023/1791 I

Anhang 1: Politiken und Maßnahmen entlang der fünf Dimensionen der Energieunion I

Section A: National plan

1. OVERVIEW AND PROCEDURE FOR DRAWING UP THE PLAN

1.1. Summary

1.1.1. Political, economic, environmental, and social context of the plan

This plan is in the context of the endangered timely achievement of the objectives of the UN General Assembly resolution of 25 September 2015 entitled ‘Transforming our world: the UN 2030 Agenda for Sustainable Development’ and the Paris Agreement (Paris Climate Agreement). In particular, it contributes to the achievement of SDG 7 to ensure access to affordable, reliable, sustainable and modern energy for all. At the same time, the plan contributes to the timely implementation of Goal 13 to take immediate action to combat climate change and its impacts, in line with the systemic integration of the SDGs.

Strengthening our resilience and competitiveness in Germany and Europe, and achieving the goal of climate neutrality by mid-century at the latest, while securely available at competitive prices and affordable for households, is crucial to preserve peace and freedom and preserve our prosperity and quality of life in the future.

At European level, the REPowerEU Plan, the Fit-for-55 package, set the groundwork for this, the European Climate Law. The REPowerEU plan allows for the exemption from over-reliance on individual fossil energy suppliers through ambitious energy savings, faster roll-out of renewables and the establishment of wider international energy supply relationships that increasingly rely on renewable energy. With the Fit-for-55 package, Europe is leading the world and sets out in the European Climate Law to become the first continent to become climate neutral by 2050. The aim is to limit global warming to less than 1.5 degrees and secure our future prosperity. The Green Deal Industrial Plan supports the transformation of industry towards green and competitive structures by fostering innovation and investment in green technologies.

In the light of these profound geopolitical, political and socio-economic changes, the Federal Government has revised its National Energy and Climate Plan 2021-2030 (NECP). Key elements of Germany’s energy and climate policy are the Federal Climate Protection Act, as amended in 2024, which obliges Germany to achieve net-zero greenhouse gas emissions by 2045, and the Federal Government’s climate action programmes. The lignite phase-out in North Rhine-Westphalia will be brought forward to 2030. The nuclear phase-out was completed in 2023. Based on the coal and nuclear phase-out, the Federal Government takes a technology-open approach to achieving net-zero greenhouse gas emissions. With regard to technological developments, decisions

should in principle not be taken to limit future room for manoeuvre in achieving the objectives in an efficient and environmentally sound manner, provided that these decisions do not lead to foreseeable economic cost increases in the transformation process.

Energy and climate policies are constantly being developed. For example, two legislative packages removed many obstacles to accelerating the roll-out of renewable energy and declared the use of renewable energy to be an overriding public interest. By 2030, 80 % of gross electricity consumption is to be produced from renewable energy sources. By 2030, 215 GW of photovoltaics and around 115 GW of wind on land are to be tendered, and at least 30 GW are to be developed at sea. The Energy Efficiency Act established for the first time in 2023 a cross-sectoral framework to increase energy efficiency, setting targets in line with the amendment to the EU Energy Efficiency Directive. With the recast of the Federal Climate Protection Act in 2024 and the new law in 2023, the Federal Government reaffirmed its ambitious climate targets.

Germany's climate targets remain unchanged – the reform of the Federal Climate Protection Act (KSG) must not emit more than one tonne of CO₂ than in the past. The KSG focused on past slippages before the amendment. With the amended KSG, the focus is now on projected emissions development. This will make it easier to verify whether Germany is on the right track to net-zero greenhouse gas emissions, or whether measures need to be reassessed. The focus is now on a cross-sectoral consideration of greenhouse gas emissions, leading to more flexibility between sectors. At the same time, the Federal Government continues to ensure full transparency in the individual sectors, such as transport, energy and buildings, by means of indicative paths – the sectoral perspective is retained as a guide in monitoring. By reducing emissions, especially where there is the greatest potential for savings, climate change objectives can be achieved in a socially fair and economically efficient manner. For the purpose of assessing compliance, the cumulative total annual emissions for the period 2021-2030 will be decisive in the future. If, in the opinion of the Independent Panel of Experts, these are exceeded for two consecutive years, a follow-up is required. In order to prepare the relevant decision of the Federal Government, all competent federal ministries, in particular those responsible for the sectors contributing to the exceedance, shall, within three months of the submission of the assessment of the projection data by the Expert Council on Climate Issues, submit proposals for measures in the respective sectors under their responsibility. The amendment also enshrines in the KSG that, in order to achieve the national climate objectives, the Federal Government sets a target for technical sinks for 2035, 2040 and 2045 and that in the future a comprehensive climate protection programme will be adopted in the first 12 months of each parliamentary term to meet the requirements of the Act.

In order to achieve the climate objectives while contributing to the diversification of energy imports and thus to:

Germany's security of supply has been decided by the Federal Government to update the National Hydrogen Strategy (NWS). The second amendment to the Buildings Energy Act initiates the decarbonisation of the heating sector. Under the Carbon Dioxide Cost Allocation Act, the cost of carbon dioxide in the building sector for heating oil, natural gas and other fuels must now be shared between landlords and tenants. Sustainability of public finances also remains important for the sustainability of the government. For future investments to be realised, the necessary skilled workers are needed. Skills shortages are already a challenge in some areas and regions. The Federal Government's aim is therefore to secure and expand the skills base in Germany. To this end, it drew up a new strategy for skilled workers and the German Bundestag and the Bundesrat, on a proposal from the Federal Government, adopted in summer 2023 a law and a regulation to further develop the immigration of skilled workers.

All measures and strategies referred to in or resulting from the NECP are subject to funding reservations and to the Federal Government's competence/responsibility under financial constitutional law. They do not involve a (preliminary) determination of the budget, nor do they prejudge the budget legislature. Any additional needs in terms of human and material resources resulting from the Federal Government's plan must be fully and permanently financed under the current budgetary and financial programming in the relevant section or special investment fund.

1.1.ii.Strategy related to the five dimensions of the Energy Union

In order to bring security of supply, competitiveness and climate action together in an efficient and cost-effective way in the energy transition, European solutions are needed. Germany's energy and climate policy is guided by the European framework, including the five dimensions of the Energy Union.

1.1.iii. Summary table of the plan's key objectives, policies and measures

Table A1: Key targets for 2030 along the Energy Union dimensions

1. Decarbonisation

1.1. Greenhouse gas (GHG) emissions and removals

- 🇩🇪 National climate targets: minimum -65 % by 2030 compared to 1990, at least -88 % by 2040, GHG neutrality by 2045

EU climate target: at least -55 % net by 2030 vs. 1990, broken down into:

- 🇪🇺 European Emissions Trading Scheme (ETS): EU-wide target -62 % by 2030 compared to 2005
- 🇪🇺 ETS2: EU-wide target -43 % by 2030 compared to 2005
- 🇪🇺 EU Effort Sharing Regulation (ESR): EU-wide target -40 % by 2030 compared to 2005
- 🇩🇪 Germany's ESR objective: —50 % by 2030 compared to 2005

EU LULUCF Regulation:

- ⊕ An EU-wide target of 310 MtCO₂eq in 2030, or
Improvement of the sink by 42.2 Mt. 2016-18 in 2030
- ⊕ Germany's objective is to improve the sink by 3.8 Mt. 2016-18 (target of 30.8 Mt sink based on outdated inventory data)
- ⊕ Targets for the expansion of natural sinks under Section 3a of the Federal Climate Protection Act (Bundes-Klimaschutzgesetz) climate-neutral organisation of the federal administration by 2030

1.2. Renewable energy

- ⊕ Increase the share of renewable energy in gross final energy consumption in 2030 to at least 42.5 % as Germany's contribution to the EU 2030 target
- ⊕ Electricity (600 TWh RES-E in 2030, at least 80 % of gross electricity consumption)
- ⊕ Heating and cooling: 50 % of grid-linked renewable heat and/or unavoidable waste heat by 2030
- ⊕ Traffic: 30 % of gross final energy consumption in 2030 (according to RED II methodology)
- ⊕ In addition, Technology-specific targets in the electricity sector in 2030 (installed capacity 2030 in GW)
 - ⊕ Wind onshore: 115 GW to 2030.160 GW by 2040
 - ⊕ Photovoltaics: 215 GW to 2030.400 GW by 2040
- ⊕ Wind at sea: at least 30 GW to 2030.40 GW by 2035 and 70 GW by 2045
- ⊕ Biomass: GW by 2030
- ⊕ Hydropower and others: No specific legally defined hydropower targets
- ⊕ National Hydrogen Strategy: Accelerate market uptake for hydrogen

2. Energy efficiency

- ⊕ According to the Energy Efficiency Act, which entered into force on 18 November 2023, Germany's final energy consumption (PEC) is to be reduced by at least 26.5 % to a final energy consumption of 1 867 terawatt-hours by 2030 compared to 2008, and primary energy consumption (PEV) by at least 39.3 % to a primary energy consumption of 2 252 terawatt hours.

3. Security of energy supply

- ⊕ Meet energy demand in Germany at all times
- ⊕ Maintaining resilience to supply crises

¹As recommended by the European Commission on 18.12.2023.

- ⊕ Further reduce the likelihood of supply crises occurring
- ⊕ Provide for precautionary measures and reserves in the event of a deterioration in the supply situation;
- ⊕ Ensure stable system operation

4. Internal energy market

- ⊕ Achieving the envisaged level of interconnection in accordance with Article 4(d) of the Governance Regulation
- ⊕ Expand and modernise networks in line with their needs
- ⊕ Looking at energy infrastructures together
- ⊕ Electricity, Heat and Transport Sector Coupling
- ⊕ Gradual reduction and closure of coal-fired electricity generation
- ⊕ Further strengthen the European internal electricity market and ensure flexibility in electricity demand.
- ⊕ Further coupling electricity markets

5. Research, innovation, competitiveness

- ⊕ The Federal Government aims to strengthen energy research and research and innovation for climate action in the period from 2020 to 2030.
- ⊕ Drive forward-looking innovations for the transformation of energy supply
- ⊕ Maintaining and developing a competitive base for industry, business and SMEs and jobs in Germany and laying the foundations for prosperity and quality of life

Table A2: Key policies and measures along the Energy Union dimensions

1. Decarbonisation

1.1. GHG emissions and removals

- ▶ Action Programme on Natural Climate Action to Conserve and Extense Natural Sinks
- ▶ Drive change of cars and heavy-duty vehicles (CO₂- surcharge HGV toll, extension of HGV toll to vehicles above 3.5 tonnes, deployment of basic infrastructure networks for battery electric and hydrogen trucks, Clean Vehicle Procurement Act for public fleets, Special Traffic Programme, fleet renewal programme for heavy-duty vehicles)
- ▶ Building digital and data-based ecosystems for a net-zero industry
- ▶ Accelerating climate neutrality of cars (Masterplan charging infrastructure, various short-term measures to increase the roll-out of charging columns, amendment of the Car-Sharing Act to accelerate the conversion of car-sharing fleets)
- ▶ Federal support for energy and resource efficiency in the economy
- ▶ Federal programme STARK (strengthening the transformation dynamics and break-up in the reversibility and coal-fired power stations) to promote structural change in coal regions
- ▶ CO₂- Pricing for the transport and heat sectors (BEHG)
- ▶ Carbon dioxide Cost Allocation Act
- ▶ Digitalisation for climate action (funding directive Digitalisation of municipal transport systems, research on the application of AI methods in mobility)
- ▶ Introduction of a digital nutrient origin system to improve data availability on agricultural fertilisation
- ▶ Development of a Carbon Management Strategy
- ▶ Development of a nutrition strategy by the Federal Government, including measures to promote a more plant-based diet
- ▶ EU Emissions Trading Scheme
- ▶ The Federal Government's strategy for skilled workers, including to ensure the need for skilled workers in areas particularly relevant to climate change
- ▶ Support programme for adaptation of urban and rural areas to climate change

- ▶ Support programme for decarbonising industry, future federal support for industry and climate protection
- ▶ Support programmes for sustainable urban mobility plans and corporate mobility management
- ▶ Promotion of livestock farming that is compatible with climate change and animal welfare through support programme for housing
- ▶ Timber construction initiative
- ▶ IPCEI hydrogen and battery cell manufacturing
- ▶ Climate-friendly air, maritime and inland waterway transport (national climate-friendly shipping action plan, federal financial support for the development of shore-side electricity installations, further development of the aviation research programme to effectively reduce the climate impact of aviation, support for renewable ground power supply at airports, new funding focus on climate-neutral ship in the Maritime Research Programme)
- ▶ Climate change contracts
- ▶ Coal Electricity Discontinuation Act
- ▶ Measures for a climate neutral federal administration (§ 15(1) KSG)
- ▶ Modernisation of road transport legislation with a view to taking into account climate objectives;
- ▶ Strengthening market surveillance in the field of eco-design and energy labelling
- ▶ Strengthening urban and regional rail transport (e.g. by strengthening the ramp-up of rail investment and strengthening and digitalisation of the rail network, proportionally promoting rail track prices as an incentive for investment, introduction of German tickets)
- ▶ Technology transfer programme light construction, greater focus on material efficiency and circular economy
- ▶ Improved data availability for agricultural fertilisation: An amendment to the Fertiliser Act and the planned introduction of a monitoring regulation to review the effectiveness of the Fertiliser Ordinance are intended, inter alia, to create the conditions for a digital system of origin for nutrients.
- ▶ Improvement of local public transport and the interconnection of different modes of transport (including strengthening of combined transport terminals, cycling infrastructure development initiative, expansion and quality plan for local public transport, promotion of climate-neutral buses including infrastructure, model

projects to strengthen local public transport, promotion of alternative powertrains for rail vehicles)

- ▶ Scaling up the potential of synthetic fuels (including a roadmap for climate-neutral fuels)
 - ▶ Further development of the support programme for improving energy efficiency in agriculture, use and storage of renewable energy as a further funding priority
- Further development of the National Agency for Food Waste Reduction

1.2. Renewable energy

- ▶ Speeding up planning and permitting procedures for the deployment of wind energy onshore and at sea.
- ▶ Better regionalisation of renewable energy production
- ▶ Better synchronisation of renewable energy expansion with electricity grid expansion
- ▶ Subsidising the purchase/leasing of pure electric vehicles by an environmental bonus
- ▶ Federal Support for Efficient Buildings (BEG)*
- ▶ Federal support for efficient heating networks (BEW)*
- ▶ Key points for a geothermal campaign
- ▶ Energy Efficiency Strategy Buildings (ESG)*
- ▶ Renewable Energy Act (EEG 2023)
- ▶ Building Energy Act (GEG)*
- ▶ Law on Heat Planning and Decarbonisation of Heat Networks
- ▶ Power plant strategy
- ▶ National Hydrogen Strategy Package
- ▶ Regional cooperation
- ▶ Empowering self-consumers in the electricity sector
- ▶ Strengthening Germany's battery cell production site
- ▶ Further development of combined heat and power (CHP)
- ▶ Offshore Wind Energy Act

1.3. Wind Power Land Needs Act

** Actions from the buildings sector (see 2. 'Energy efficiency'), which also contribute significantly to dimension 1 'Reducing CO2 emissions'.*

2. Energy efficiency

- ▶ Federal support for energy efficiency in the economy (EEW)

- ▶ Federal Support for Efficient Buildings (BEG)
- ▶ Federal support for efficient heating networks (BEW)*
- ▶ Federal funding for serial renovation
- ▶ Federal programme 'Rehabilitation of municipal institutions in the fields of sport, youth and culture'
- ▶ CO₂- Pricing in the heating and transport sectors
- ▶ Energy Services Act (EDL-G)
- ▶ Energy efficiency determinations for climate-neutral new/extension buildings and building renovations by the Federal Government 'Guide function of Federal Building for Energy Efficiency' (EEFB)
- ▶ Energy Efficiency Act
- ▶ Energy Efficiency Strategy for Buildings (ESG)
- ▶ Promoting energy advice for all consumer groups
- ▶ Buildings Energy Act
- ▶ Public Buildings Initiative to increase the rate of renovation of public buildings
- ▶ Long-term renovation strategy (LTRS)
- ▶ National Energy Efficiency Action Plan 2.0 (NAPE)
- ▶ Programme to support urban energy regeneration measures: Support for the development of integrated neighbourhood concepts, support through rehabilitation management and investment measures.
- ▶ Tax incentives for energy renovation of buildings
- ▶ Heat pump offensive
- ▶ Future construction – pilot project for innovation in buildings

3. Security of energy supply

- ▶ Expansion of LNG location in Germany including LNG Acceleration Act
- ▶ Oil Stockholding Act (petroleum BevG)
- ▶ Act on electricity and gas supply (Energy Industry Act – EnWG)
- ▶ Energy Security Act (Energy Security Act – EnSiG)
- ▶ Fuel Oil Supply Restriction Regulation (HeizöLLBV)
- ▶ Fuel Supply Restriction Regulation (KraftstoffLBV)
- ▶ Mineral Oil Compensation Regulation (MinölAV)
- ▶ Mineral Oil Management Regulation (MinölBewV)
- ▶ Mineral Oil Data Act (MinÖlDatG)
- ▶ National Preventive Action Plans and Emergency Plans for Natural Gas under Regulation (EU) 2017/1938 (formerly Regulation (EU) No 994/2010)

- ▶ Roadmap System stability for secure and robust grid operation with 100 % renewable energy
- ▶ Solidarity mechanism under Regulation (EU) 2017/1938
- ▶ Regulation on the security of gas supply in a supply crisis (Gas Security Regulation – GasSV)

4. Internal energy market

Scale up and modernise networks as needed:

- ▶ Monitoring of grid expansion projects for electricity and gas
- ▶ Optimisation of the stock networks
- ▶ Faster deployment of electricity grids
- ▶ Massively accelerate smart meter rollout and by 2030 (or 2032 for large power plants and large consumers)

Gradual reduction and closure of coal-fired electricity generation:

- ▶ Coal Electricity Discontinuation Act
- ▶ Structural Accompanying Measures

Electricity, heat and transport sectors:

- ▶ Remove barriers to the coupling of electricity, heat and transport sectors

Keep the electricity market 2.0 functioning and ensure flexibility of the energy system:

- ▶ Further integrate and make European electricity markets more flexible
- ▶ Redispatching principle: Redispatch optimisation measures
- ▶
- ▶ Increase flexibility through pilot projects for modernised CHP plants
- ▶ National flexibility check to collect flexibility barriers and identify flexibility potentials

Further coupling electricity markets:

- ▶ Action plan to reduce grid congestion
- ▶ Optimisation of underground trading capacities
- ▶ Creation of a Central and Eastern European Capacity Calculation Region (CORE)

Achieving the envisaged level of interconnection in accordance with Article 4(d) of the Governance Regulation:

- ▶ Development of cross-border electricity interconnectors
- ▶ Strengthen regional cooperation

5. Research, innovation, competitiveness

- ▶ 7. Energy Research Programme – Innovation for the Energy Transition
- ▶ 8. Energy research programme on applied energy research
- ▶ Better involvement of start-ups
- ▶ Regulatory sandboxes for the energy transition and strengthening technology transfer
- ▶ Strengthening international cooperation
- ▶ Cross-system issues (e.g. sector coupling, digitalisation)
- ▶ Future strategy for research and innovation (mainly missions 1 and 2)

1.2. Overview of current policy situation

1.2.1. National and Union energy system and policy context of the national plan

Climate change is one of the biggest challenges of our time. The Federal Government sets its climate, energy and economic policies on a 1.5 degree trajectory at national, European and international level. It derives its objectives ambitiously from the joint contribution to which the European Union is committed under the Paris Agreement.

Energy and climate policies need a European framework, as energy and climate policy choices by one Member State inevitably affect other Member States.

Energy efficiency and the development of renewable energy will be key pillars of the European energy transition. This is in line with and supports the German energy transformation strategy.

The completion of the European internal energy market is a prerequisite for the success of the energy transition in Germany and the EU. Open, flexible markets and fair competition are essential for a cost-effective and secure energy supply and for the integration of renewable energy into the market.

Electricity markets need to be interconnected and provide the necessary price signals. This will provide a safe framework for the necessary investments and the flexibility of energy production and consumption.

The updated NECP goes hand in hand with the recovery and resilience plan (DARP). The DARP focuses on tackling climate change and digital transformation. It also includes measures to achieve the objectives of the updated NECP. The updated NECP is consistent with other key EU and federal initiatives and contributes to their implementation in order to exploit synergies.

1.2.11. Current energy and climate policies and measures relating to the five dimensions of the Energy Union

See chapter 1.1.ii. for a summary. A detailed description is given in Chapter 3.

See Annex 1 (Table on policies and measures along the five dimensions of the Energy Union)

1.2.111. Key issues of cross-border relevance

Dimension 1: Reducing CO₂ emissions

1.1 *GHG emissions and removals*

Germany contributes to the achievement of the EU's 2030 climate target and to the objectives of the Paris Agreement on climate change. Exchanges with other Member States mainly take place on national climate change strategies and on non-state and sub-state climate projects (by NGOs and municipalities) in order to share experience and best practices and to identify and discuss possible impacts on other Member States as early as possible. Another key issue in exchanges with other Member States is the design and implementation of EU climate policy.

1.2 *Renewable energy*

Due to the geographical location of Germany in the middle of Europe, the development of renewable energies in Germany has multiple effects on its neighbouring countries. Grid and system integration of renewable energies is a high priority for the Federal Government (see Chapter 3.1.2.). The Federal Government focuses on regional cooperation with other Member States, which is an important driver for the market integration of renewable energies. The Federal Government is therefore opening tenders for electricity from renewable energy sources for installations located in other EU Member States. On the island of Bornholm, Germany and Denmark will develop a joint offshore project and connect to the German and Danish electricity grids. The Federal Government also participates actively in the North Seas Energy Forum and participates in the working group on renewable energies as part of the Baltic Energy Market Interconnection Plan (BEMIP) (see Chapters 1.4., 3.2., 3.4.3.). Germany also has an active role from the outset in the Concerted Action Forum for Renewable Energy (CA-RES).

Dimension 2: Energy efficiency

In principle, this dimension does not include issues of direct cross-border relevance. However, there are cross-border cooperation projects with EU neighbouring countries and various initiatives to exchange best practices in the field of efficiency (see Chapter 3.2.).

Dimension 3: Security of energy supply

Functioning energy markets provide the best guarantee to ensure the security of energy supply throughout the Union and to reduce the risk of harmful consequences of supply disruptions. Where the security of energy supply of one Member State is threatened, there is a risk that measures taken unilaterally by that Member State jeopardise the proper functioning of the internal market and affect the supply of energy in other Member States. Different import routes are available to supply the German gas

market, through which neighbouring markets can also obtain gas from Germany through different routes. Solidarity agreements have been concluded with several European countries to provide each other with gas supplies in an emergency, most recently in March 2024 with Italy and Switzerland. Import diversification is taking place, inter alia, through the construction or expansion of LNG infrastructure for Germany and neighbouring countries. This will reduce the risk of supply disruptions for both German and neighbouring gas markets. Similarly, the German electricity market is strongly integrated into the European internal electricity market. It is an essential pillar for the security of supply of electricity in Germany and Europe. Security of supply will also be strengthened by the ramp-up of other energy sources. For example, in Germany, a high-performance hydrogen infrastructure is to be built, which will already be connected to EU neighbouring countries in 2030 via a first European hydrogen network.

In order to be able to carry out cross-border measures to maintain security of supply in neighbouring Member States in the event of a crisis, i.e. in the event of a significant and persistent shortfall in energy demand, cross-border coordination between the German and neighbouring foreign actors involved is imperative, if necessary with the assistance of the competent authorities.

Dimension 4: Internal energy market

The European single market is the backbone of the European energy transition and is central to ensuring a secure, cost-effective and environmentally sound energy supply also in Germany.

The exchange of electricity between EU Member States is becoming increasingly important: Cross-regional synergies between generation and consumption can be exploited to make the electricity system even more flexible. The Federal Government is therefore actively participating in various regional cooperation fora with a view to deeper integration of the European internal electricity market. In particular, see also the Pentalateral Energy Forum and the Baltic Energy Market Interconnection Plan (BEMIP) (see Chapters 1.4., 3.2., 3.4.3.).

Dimension 5: Research, innovation, competitiveness

Like many European Member States, Germany faces major research and innovation challenges in the context of the energy transition towards a greater share of clean and renewable energy. In particular, the integration of increasing volumes of fluctuating input from wind and solar power, the digitalisation of energy supply and – sector coupling including thermal energy are common themes and continue to rely on technological innovation. Regional cooperation helps to deal effectively with issues together, to make effective use of cross-border infrastructure and to make efficient use of financial resources. Research cooperation takes place in the international and in particular European framework through the Federal Government's participation in Horizon 2020/Europe and the implementation of the objectives of the Strategic Energy

Technology (SET) Plan through joint research projects and coordination on funding priorities. Regional and bilateral cooperation is an opportunity to pool efforts and implement them more effectively in geographical and thematic commonalities. Last but not least, international cooperation is a prerequisite for Germany to:

Maintain a world-class research landscape across technologies.

1.2.1 v. administrative structures for the implementation of national energy and climate policies

The energy transition and climate protection are implemented by the Federal Government, the Länder and the municipalities. At federal level, the Federal Ministry of Economic Affairs and Climate Protection (BMWK) is the lead ministry.

The federal and Land levels continually coordinate on the implementation of the energy transition. The Federal Chancellor meets the heads of government of the Länder every six months, with the participation of the relevant Federal Ministers. They discussed, among other things, the state of implementation of the energy transition. The relevant federal and regional ministers also discuss (semi-)annually their priorities and coordinate the next steps of the energy transition in the context of energy, environment and economic ministerial conferences. These bodies are prepared through continuous cooperation and close exchanges at technical level in subordinate working bodies (such as the Standing Committee on Climate Change). This institutional cooperation is complemented by ad hoc conferences and workshops (e.g. Regional Conference on the Development of Renewables) and regular discussions at management level.

1.3 . Consultations and involvement of national and Union entities and their outcome

1.3.1 National consultation of stakeholders, including social partners, and cooperation with civil society and the public

Energy and climate policy objectives and measures are continuously developed and developed in close dialogue with stakeholders, civil society and the public. The Federal Government relies mainly on measures-related opportunities for participation in energy and climate policy processes. For example, many of the policies and measures summarised in the updated NECP have already been subject to multiple dialogues and participation processes before the NECP is established, and others are being implemented or planned.

These include, in particular, partly cross-action and cross-sectoral dialogue formats, with the aim of supporting a coherent strategic orientation of energy and climate policies in exchange with stakeholders and civil society. Examples are:

Follow-up of the system development strategy by stakeholders' plenary sessions:

The System Development Strategy (SES) is enshrined in the Energy Industry Act as one of the foundations of the grid development plans for electricity and gas/hydrogen. This is to ensure that infrastructure planning is cross-sectoral and coherent. The preparation of the SES will be accompanied by a stakeholder assembly involving around 40 representatives from the energy sector, industry, civil society and politics. The interim report of the system development strategy was published in November 2023 and was subsequently consulted. The contributions to the consultation and an [evaluation are published at https://www.bmwk.de/Redaktion/DE/Dossier/Energiewende/ko_n_sultation_interim_system_development_strategy.html](https://www.bmwk.de/Redaktion/DE/Dossier/Energiewende/ko_n_sultation_interim_system_development_strategy.html).

Platform Climate Neutral Electricity System (PKNS): In the coalition agreement of the ruling parties, the ‘Climate-Neutral Electricity System Platform’ (PKNS) was conceived as a process with broad involvement of stakeholders from politics, business, academia and civil society to develop approaches to electricity market design in a largely climate-neutral electricity system. In a common process, solutions are identified, assessed against criteria and targeted concrete actions for medium and long-term design.

Federal Minister for Economic Affairs Dr Robert Habeck opened the process with a plenary session on 20 February 2023. Since then, alongside other plenary meetings, regular meetings of the working groups have taken place on the four topics ‘Securing the financing of renewable energies’, ‘Expanding and integrating flexibility options’, ‘Financing controllable capacity to cover residual loads’ and ‘Local signals in electricity markets’. In August 2023, the Registry published the first report entitled ‘Report on the work of the Climate-Neutral Electricity Platform (PKNS)’. Another report was published in April 2024.

Industry dialogue to accelerate grid connections

The fast connection of renewable energy installations, electricity storage, charging infrastructure and heat pumps to the electricity grid is key to achieving Germany’s energy and climate policy objectives. The rapidly growing number of installations and complex processes represent a major challenge for all actors involved, in particular network operators and subscribers. The BMWK therefore initiated the industry dialogue on ‘Accelerating grid connections’ in June 2022. The aim is to identify practical challenges in connection to the grid, to develop and implement practical solutions. The regulatory framework as well as the grid connection processes of the over 850 distribution system operators in Germany need to keep pace with the rapid evolution of the energy transition and decarbonisation. A focus agenda developed in industry dialogue serves as a work plan. In the context of a ‘grid connection summit’, on 16 April 2024, the 24 associations taking part in the industry dialogue, in the presence of Dr Habeck, Federal Minister for Economic Affairs, agreed to jointly address the measures of the focus agenda. The sectoral dialogue is ongoing until the end of 2025. Associations will be involved through written consultations, surveys and workshops.

Roadmap Energy Efficiency 2045: With the participation of representatives from academia, business and civil society, the Roadmap Dialogue process was launched in

summer 2020 and continued until 2023. The aim was to identify the need for energy efficiency and energy savings and to demonstrate their strategic role in the energy transition. To this end, the actual situation was scientifically analysed and the need for action was systematically deduced.

Six working groups discussed cross-sectoral pathways to achieve the reduction target, described ways of implementation and developed concrete tools and measures to increase energy efficiency. In the roadmap process

all energy sectors were addressed as well as cross-sectoral aspects. The topics covered were industry, buildings, transport, digitalisation, skilled workers & skills and system issues.

Climate handcraft round table: The BMWK, together with trade unions and the crafts organisation, has been running the Future Craft Dialogue since March 2023. This is a sectoral dialogue that focuses, among other things, on the energy transition and sustainable economies. A key building block of the Future Dialogue is the Climate Trade Roundtable. It focuses on the craft professions that are particularly relevant to the success of the energy transition and is intended to contribute to a common understanding of the trades concerned among themselves, as well as of crafts, trades unions and other stakeholders as a whole, on issues specific to crafts and specific measures of particular importance for the transformation process. It also provides important impetus for other political or technical processes, for example with a view to improving cross-trade cooperation between craft businesses by optimising processes and developing digital interfaces, or discussing cross-cutting issues relating to skills development in crafts and crafts.

“Energy Change Dialogue” (DEW) and Citizens’ Dialogues of the information and activation campaign “80 million together for energy change”: The main format of the ‘80 million Together for Energy Change’ campaign launched in 2022 is the ‘Energy Change Dialogue’, which ensures exchanges with stakeholders in the field of energy transition and energy efficiency. A dedicated office organises the active information of associations and institutions, serves as a contact point for enquiries or proposals, and organises multiplier formats around energy change, expansion of renewable energies and energy efficiency. At trade and public fairs and events, the ‘Energy Change Dialogue’ with an information stand provides an opportunity for direct exchanges with stakeholders and citizens.

In addition, in the second half of 2023, a series of citizens’ dialogues was organised in different regions of Germany with the Energy Change Campaign to enable direct exchanges with local citizens. Here, citizens had the opportunity to discuss cross-cutting and local topics on energy change and climate change together in workshops, and to ask questions directly to representatives of the BMWK at State Secretary level. The Citizens’ Dialogues were accompanied by a campaign stand of the ‘Energy Change Dialogue’, which, in addition to information on the development of renewable energies, also allowed for further dialogue with local experts.

Building-Renovation Compass (GSK) Dialogue Process – Acceleration Plan for Climate-Neutral Buildings: The ‘Buildings-Renovation-Kompass’ dialogue process was initiated in April 2024 as part of the Climate-Neutral Building Forum of the German Energy Agency (dena) on behalf of the BMWK. It aims to identify, together with stakeholders across the sector, concrete measures to improve the energy performance of the buildings sector, which will help to accelerate the achievement of the 2045 climate neutrality objective.

The format foresees the establishment of a platform for exchange at action level: The focus will therefore be on integrating existing and new measures, creating synergies and identifying additional efforts to transform the building sector. As a result, stakeholders will identify the necessary measures and pool their knowledge through cooperation.

The format workshop will initially consist of a multi-stage process with thematic meetings on topics (1).

Communication, advice, planning, (2) implementation of rehabilitation and (3) financing. Mobilising private capital and social aspects.

Heat planning stakeholder dialogue: By conducting a stakeholder dialogue, the Federal Ministry of Housing, Urban Development and Construction (BMWSB), in cooperation with the Federal Ministry of Economic Affairs and Climate Protection (BMWK), pursues the objectives of providing short-term technical support to the Länder when implementing the heat planning law in provincial law and to the municipalities in the first implementation of heat planning. It also establishes a framework for the exchange of all those involved in heat planning. These include, in particular, selected participants as additional participants:

Institutions and industry associations, as well as individual selected municipalities and municipal works. Best practice examples are identified and presented in the participating municipalities. The launch will take place in July 2024 and a workshop process will follow.

Transformation of gas/hydrogen distribution networks: The transformation of energy supply requires a framework of planning, legal and financial arrangements for gas distribution systems, which, on the one hand, ensures secure and affordable energy supplies to households and businesses, on the other hand, provides planning certainty for municipalities and distribution system operators and does not lead to undue hardship. The requirements of the EU gas/hydrogen internal market package and interactions with the Heat Planning Act and the Buildings Energy Act must also be taken into account. The BMWK has published a Green Paper for discussion and evaluates the comments received. The consultation procedure is not a pre-fixing exercise, but questions about the need to make the legal framework more flexible.

Other examples include:

- Develop a PA strategy with public consultation and summit events to consult countries and associations in spring 2023;
- Develop a Wind-on-Land strategy with public consultation and summit events to consult countries, departments, associations and social partners in spring 2023;
- Heat pumps summit events with BMWK and BMWSB to consult with departments, industry representatives, trade unions and consumer protection (2023);
- District heating summit to discuss with business, industry, environment and consumer protection associations and trade unions in summer 2023;
- Industry process to develop the roadmap for system stability;
- Regional conference(s) “Steering for Renewables” with decision-makers in planning and permitting at Land, regional and local level, councillors, representatives of regional energy agencies and municipal associations (summer 2023, continued autumn 2024);
- Climate-neutral heating dialogue with key stakeholders in the first half of 2021.
- E-mail consultation of the Länder, associations, NGOs and scientific institutions on the draft climate action programme 2 023 in June/July 2023;

In addition, regular consultations, consultations and participations are carried out as part of legislative and planning procedures.

For example, the legislative procedures for the amendment of the Renewable Energy Act, the amendment of the Buildings Energy Act and the development of the Major participations have been carried out.

For participatory processes in planning processes, energy infrastructure planning should be highlighted by way of example:

Hydrogen core network: The planning of the hydrogen core network shall accompany the BMWK or BNetzA with a consultation process in order to bring together stakeholders such as federal states, municipalities, associations and undertakings and to take into account legitimate concerns. The consultation included an opportunity to comment on the so-called state of play of planning in July 2023 and a consultation of the draft request presented by the transmission system operators in winter 2023-2024. BNetzA also consults the final core network application prior to approval after the transmission system operators submitted the core network application to BNetzA in July 2024. In order to draw up the first integrated network development plan for gas

and hydrogen to be confirmed by the Federal Network Agency by 30 June 2026, the legal provisions also provide for multiple opportunities for participation.

Electricity transmission network: A multi-step participatory process is foreseen during the planning of the electricity transmission network in the network development plan. BNetzA publishes the draft TSOs on the scenario framework for consultation (last January 2022). The results will feed into the approval of the scenario framework by the Bundesnetzagentur. The electricity network development plan based on this will be developed and consulted in several steps. First, TSOs prepare a first draft for public consultation (last March 2023). The revised second draft will be reviewed and re-consulted by the Bundesnetzagentur (latest September 2023). On this basis, Bundesnetzagentur confirms the network development plan (last of the 2023-2037/2045 Network Development Plan on 1 March 2024).

Consultation of the draft NECP: In addition to the action-based participatory processes outlined above, the draft NECP was subject to an online consultation in the period from 24 January 2024 to 17 March 2024 and cross-checked the appropriateness and weighting of objectives and measures.

The online consultation was published on the BMWK website. The draft NECP, together with further explanations, is also available there:

<https://www.bmwk.de/Redaktion/DE/Textsammlungen/Energie/necp.html>. After moderate initial participation, the consultation was also referred to in the BMWK Energy Transition Newsletter and on social media after about half of the consultation period.

Most of the online consultation was attended by associations and civil society organisations, and on an ad hoc basis by businesses and individuals.

The weighting of the different dimensions was only partially assessed as inadequate. Additional comments were, inter alia, in favour of a stronger

Take into account impact assessments and investment needs, gender aspects, the reduction of fossil subsidies and energy efficiency (including waste heat use). Some overweighting of energy security was also noted.

The own level of information on NECPs and energy and climate policies was rather mixed. In addition, the form of participation has been criticised on several occasions. Further forms of participation and information will be explored for future procedures for the establishment of the NECP, taking into account the limitation of administrative burden and the avoidance of duplication with activity-related forms of participation.

In particular, the consultation asked about a classification of the appropriateness of objectives and measures with a level of differentiation of five options. The level of

ambition and action tends to be too low.

For each dimension, the results of the consultation were as follows:

In the decarbonisation dimension, the greenhouse gas reduction targets were mostly assessed as 'too unambitious' to 'adequate', while the level of ambition was largely understated in terms of the measures taken to achieve it. A far too high level of ambition was not reported by any of the participants. Similarly, the renewable energy expansion targets were largely assessed as 'too unambitious' to 'adequate', but there was more feedback in the area of too ambitious compared to greenhouse gas reductions. In terms of the measures taken, the level of ambition was mostly too low, but at no point was the level of ambition too high or far too high. In addition, the importance of hydrogen and green molecules, the importance of CCS and negative emissions, the need for further action in particular in the buildings and transport sectors, open financing issues and equity in distribution were also highlighted.

In the energy efficiency dimension, the objectives were mostly assessed as 'too unambitious' to 'adequate', but sometimes too 'too unambitious'. With a view to:

the measures taken in this respect were mostly reported to be too low in ambition, but less clearly than in the decarbonisation dimension. A little more participants indicated that they were unable to assess this. Very similar feedback was received with regard to measures specifically in the building sector. In addition, reference was made, inter alia, to compliance with the 'Efficiency First' principle. It also called for compliance with renovation obligations and adaptation of new building standards, but also stressed the challenging financing and energy poverty, despite funding possibilities.

In the energy security dimension, the measures taken were mostly assessed as 'too unambitious' to 'adequate', sometimes also 'too unambitious' and 'too ambitious'. Diversification tended to be perceived as insufficient. In addition, the importance of local and regional energy production was highlighted, but at the same time (import) dependencies were highlighted. With regard to energy carriers, the importance of hydrogen technologies, liquid energy carriers, bioenergy and nuclear energy was explicitly mentioned, but at the same time it was also pointed out that technology was open to technology or that there was too much focus on fossil fuels. The importance of infrastructure and value chains was also highlighted.

The internal market dimension specifically asked about infrastructure and electricity market. For the most part, it was stated that it was not possible to assess the appropriateness here. With regard to energy transmission infrastructure, the picture tended to be critical, but the approach taken by a large electricity market area was largely assessed positively. In addition, the importance of hydrogen infrastructure or 'green molecules' was highlighted, as well as a greater focus on energy poverty and the involvement of neighbouring countries. Attention was also drawn to infrastructure costs.

In the innovation and competitiveness dimension, the adequacy of measures has been assessed mostly in a neutral way, or positive and negative trends are similar. In terms of competitiveness, the picture tends to be more critical. Additional information was provided with regard to research/

Innovation includes synthetic fuels, green molecules, CCS, biomass, new renewable energy technologies and gender-specific research. In terms of competitiveness, reference was made, inter alia, to global methane emissions and other standards or carbon pricing, but also to high energy prices, environmentally harmful subsidies and skilled workers.

In addition, further comments were submitted via the e-mail address published in the context of the consultation.

In addition to environmental associations and civil society organisations, business associations have participated. The opinions were mostly critical.

Across the board, critical comments were made, inter alia, on the procedure for establishing the NECP, in particular with regard to the participation process carried out beyond action-related participations across the scope of the NECP. One of the criticisms was that no consultation had been carried out before the draft was drawn up, which is incorrect and not required under Article 10 of the Governance Regulation, given the wide variety of specific opportunities for participation.

In addition, the scope and level of detail, as well as the plausibility of the information included, were criticised (including the addition of the projections on planned measures, more detailed information on investment and financing needs and price developments, more precise data on flexibility needs and the overall lack of plausibility/underestimation of data bases and the underlying assumptions). Overall, it also called for a higher level of ambition (in particular to achieve the objectives of the Paris Agreement on climate change, for (methane) emissions from agriculture and innovative renewable energy technologies) and for further measures to achieve the targets set (especially in the area of buildings, transport, livestock farming).

Some action-related comments were also made.

Regarding the decarbonisation dimension, the need for additional measures was highlighted. In particular, the building sectors (specific revision of the JIT, effective minimum standards, renovation plan of public buildings), transport (specific fiscal reforms related to official cars and reduction of subsidies harmful to climate change); Measures related to advanced biofuels) and agriculture/animal farming (specifically methane reduction target, animal number reduction, consumption-dependent measures). With regard to renewable energies, more detail was called for (in terms of sectors, production volumes and price development, among others); a target for innovative RES technologies should be included. It also called for the reduction of climate-damaging subsidies, including to close financing gaps. There is a need for

clarification and revision in this regard, in particular with regard to the concept of subsidy used and the timetable.

With regard to the energy efficiency dimension, it called for closing the remaining target gap and calling for greater compliance with the Efficiency First Principle. In particular, emergency measures were needed in the buildings and transport sectors.

With regard to the energy security dimension, no additional specific demands have been made.

With regard to the internal market dimension, the role of flexibility/energy storage in the energy system was highlighted in particular. These topics are discussed in detail in particular in the Climate-Neutral Electricity Platform and in the framework of the Electricity Storage Strategy (see Chapters 2.4.3. and 3.4.3). It also highlighted the importance of energy poverty or transport poverty, including the addition of a national indicative target, more detailed estimates and support options (see Chapters 2.4.4. and 3.4.4.).

With regard to the innovation and competitiveness dimension, emphasis was placed on the importance of innovative renewable energy technologies and the promotion of research in this regard.

1.3.ii Consultations with other Member States

Consultations on the NECP with the other Member States took place, inter alia, in the framework of the NSEC/Penta (see also chapter 1.4). The first consultations took place on 09.

November 2023, participating countries reported on the main changes in their draft updated NECPs, in particular on the new energy efficiency and renewable energy targets. In the following break-out groups, the representatives of the participating countries exchanged views on the joint projects, mainly in the field of offshore wind and hydrogen. The issue of “flexibility of networks” was also discussed.

During the second NSEC/Penta consultations on 25 March 2024, the participating countries reported on the main changes in the final updated NECPs compared to the submitted drafts. In addition, in the area of cross-border cooperation, hydrogen and CO₂ infrastructure and the availability of raw materials were discussed.

Regional exchanges were also held in the framework of the EU Strategy for the Baltic Sea Region (EUSBSR).

In addition, Germany’s neighbours were invited to bilateral exchanges on the respective updated NECPs. This took place partly virtually and partly in person. In addition, the Federal Government is in regular dialogue with all EU Member States on energy and climate policy issues.

1.4. Regional cooperation in preparing the plan

Germany is in regular contact with other Member States to cooperate in joint projects for the production of electricity, heating or cooling from renewable sources. For Germany, the development of offshore cooperation projects in particular plays a key role in this context (cf. Chapter 3.1.2.ii). Against this background, Germany is currently developing a cooperation strategy for renewable energy to set out Germany's framework and objectives for cooperation projects with other Member States.

1.4.1. Elements subject to joint or coordinated planning with other Member States

When drafting the NECPs, the EU Member States of the Pentalateral Energy Forum (Belgium, Luxembourg, the Netherlands, France, Austria and Germany) exchanged views. Germany has also exchanged bilaterally with several neighbouring countries, including Denmark, Austria and the Czech Republic.

Cooperation in the Pentalateral Forum is a joint cooperation between ministers responsible for energy policy. The following chapter therefore reflects the views of energy ministers.

COMMON PENTA CHAPTER FOR NATIONAL ENERGY AND CLIMATE PLANS

Pentalateral Energy Forum – Platform for Regional Energy Cooperation

The Pentalateral Energy Forum (Penta) is the voluntary regional cooperation since 2005 between Belgium, France, Germany, Luxembourg, the Netherlands and Austria since 2011, representing more than 40 % of the EU population and covering more than 50 % of EU electricity generation. Switzerland has been a permanent observer since 2011 and has been actively involved in technical work and decision-making. In close cooperation with the European Commission (on invitation), the Pentalateral Energy Forum promotes cooperation between all relevant parties to contribute to a reliable, decarbonised and efficient electricity system based on integrated and well-functioning markets. As the electricity sector plays a crucial role in the overall decarbonisation of our societies by 2050 at the latest, Penta countries aim to further increase the share of renewable energy and fully decarbonise their electricity system as soon as possible and ideally by 2035.

Cooperation is led by ministers responsible for energy policy, who meet regularly.

The follow-up of the activities will be ensured by the Penta coordinators led by the respective Directors-General of the PentaLänder. The work programme is implemented by ministries, transmission system operators (TSOs), distribution system operators (DSOs), regulatory authorities and market participants, who meet regularly in four thematic support groups. In order for each Support Group to achieve its objective, exchanges between and within the Support Groups will be strongly encouraged and supervised at the level of the NSEC Coordinators. The support groups also liaise with

other international fora, such as North Seas Energy Cooperation.

As the transition to a decarbonised energy system continues to accelerate, countries become increasingly interdependent and regional cooperation becomes increasingly important to address the emerging challenges. The Pentalateral Energy Forum is well placed to address these challenges, such as security of supply, market integration, energy efficiency and decarbonisation. Over the past two decades, the PentaLänder have moved from a purely national perspective to energy markets towards a regional approach. This puts the Penta countries in an ideal position to contribute to the next phase of the energy transition.

Security of supply

Security of supply has been a key issue since the establishment of the Pentalateral Energy Forum. Since then, countries have been working closely together to promote security of supply, solidarity and confidence-building, and to prevent, anticipate and manage electricity crises. Remarkable milestones have been achieved through various regional adequacy assessments, joint crisis exercises and a common framework under the EU Regulation 2019/941 on risk-preparedness in the electricity sector.

Today, the work on security of supply is organised in a dedicated support group, structured around two main areas of work: Resource adequacy assessments, on the one hand, and risk preparedness, on the other.

Future work is planned for these two work strands as well as for the interface between them.

Resource adequacy assessments

As regards resource adequacy assessment, the Penta countries will work with the European studies conducted by ENTSO-E (European Resource Adequacy Assessment, seasonal projections) to improve alignment and benefit for the Penta countries. Based on the extensive expertise and knowledge in this field, penta TSOs could carry out complementary sensitivity analyses, with a particular focus on the penta region and taking into account regional specificities and cross-border interdependencies. Topics that merit further regional analysis include:

The link between national energy system planning, the implementation of the TEN-E Regulation and the rapid development of the European energy system;

The role of Demand-Side Response (DSR) and other flexible resources to ensure system adequacy;

Methodological improvements in the assessment of resource adequacy;

The need to increase network capacity and optimise the existing network;

Analysis of critical situations and possible countermeasures.

Risk appetite

As regards risk-taking, the objective is to promote regional cooperation in the Penta region to prevent, prepare for and manage electricity crises in a spirit of solidarity and transparency, while fully respecting the requirements of a competitive internal market in electricity and the operational security procedures of transmission system operators. The Penta countries will seek efficient cooperation between all the competent authorities involved in crisis management, as well as between the European, regional and national levels. In this sense, work will be carried out on the implementation of the 1st December 2021, Letter of Intent on risk-preparedness in the electricity sector was signed, focusing in particular on:

Analysis and evaluation of regional measures, including the necessary technical, legal and financial arrangements for their implementation;

Organisation of regional exercises;

Revision of the relevant regional electricity crisis scenarios for the Penta region in close consultation with ENTSO-E and the Commission on the applicable methodologies

Should an electricity crisis occur within Penta, the agreed framework will apply.

Interface between the assessment of resource adequacy and risk preparedness

In addition, the Penta countries will work on the interface between resource adequacy assessment and risk preparedness. A first step was taken with the Penta study *Methodological Improvements in the Assessment of Resource Adequacy*, which examined differences and overlaps. Penta aims to close the existing gaps between long-term analysis and short-term operational planning, technical and political decision-making, as well as between countries. In particular, Penta intends to support the further development of analysis tools and procedures for information exchange and decision-making, closely involving ministries, transmission system operators (TSOs), distribution system operators (DSOs), regulatory authorities as well as ACER, ENTSO-E, EU DSO and the Penta Regional Security Centres (Coreso and TSCNET).

Market integration

The Pentalateral Energy Forum has two decades experience on market integration issues. During this period, Penta has witnessed and driven major changes in the political landscape, with remarkable milestones such as the introduction of the flow-oriented approach.

Market coupling first in the Penta region and now in a larger part of continental Europe.

Promoting future-proof market design

In recent years, work on market integration within Penta has expanded both in terms of focus and in terms of topics covered. Penta Ministers have consistently put hydrogen on the national and European agenda as a key element for system and market integration. The newly created SG4 is actively contributing to the development of an integrated EU hydrogen market.

The Pentalateral Energy Forum is also expected to contribute to the integration of renewable energies and the development of a future decarbonised electricity system in which integrated markets play a key role. Recently, the two studies “Vision 2050” and “Flexibility” have been commissioned for this purpose. These studies were carried out in the framework of Support Group 3 (SG3) for the future electricity system and will serve as a basis for future work in Penta.

The 2050 report compares national decarbonisation scenarios and proposes modules for a common political vision of the future electricity system. These modules describe the components necessary for the efficient development of a future electricity system. The Penta countries will continue the work on the 2050 Vision by drafting a political declaration setting out a common vision for the future integrated energy system.

In order to achieve such a future electricity system, the Penta countries recognise the need for future-proof market design and actively exchange on improving and implementing electricity market regulation; at the same time, it is important to identify areas where further action is needed. Based on their experience so far, the Penta countries will work together to identify the benefits of the integrated and market-oriented approach to possible policy issues. They will continue to exchange technical know-how and organise projects that contribute to the concrete implementation of energy policy in the Penta regions.

Flexibility

The Flexibility Report provides additional insights into the current and future state of flexibility in the region. It changes the flexibility needs and sources of flexibility for the years 2030/40/50 resulting from the integration of renewables and shows that cooperation between countries can unlock significant synergies and reduce overall flexibility needs. The report also includes important recommendations to promote flexibility across the region and possible measures to improve the flexibility of market participants. Therefore, the Penta countries will:

Exchange views on the harmonisation of non-standard products such as network congestion management (e.g. redispatching and topological measures).

Discuss how flexible behaviour of market participants can contribute to balancing the energy system through wholesale markets and ensuring the secure and stable operation of electricity grids.

Monitor the evolution of the technical requirements for the additional electricity

demand (e.g. heat pumps and other sources of flexibility) to ensure interoperability so that the additional electricity demand is truly flexible.

Cooperate on the implementation of flexibility provisions in upcoming EU legislation, such as the electricity market reform and the network code on demand management. Wherever possible, the Penta countries will seek to take into account the flexibility needs of the regions when designing national policies.

Energy efficiency

The Pentalateral Energy Forum recognises the importance of increased energy efficiency to reduce dependence on fossil fuels and the scale of the challenges of the energy transition. In this respect, Penta sees the value of both energy saving and the flexibility of electricity demand. The Penta countries exchanged views on the implementation of the electricity demand reduction commitment established by EU legislation in winter 2022/2023.

The Penta countries will continue to cooperate by exchanging on the implementation of the revised Energy Efficiency Directive and by learning about best practices in the field of energy savings.

Decarbonisation

As described above and building on the work done so far on the 2050 Vision, the Penta countries continue to work towards a common political vision for a decarbonised electricity system to be implemented as soon as possible and ideally by 2035. The Penta countries will work together to advance the development of renewable energies and raise awareness of the importance of flexibility towards a fully decarbonised electricity system without compromising security of supply. The Penta countries recognise that they are seeking better regional cooperation to exploit synergies and achieve efficiency gains. The Penta countries will analyse the added value of enhanced regional cooperation in integrating renewables, grid planning, connecting offshore to onshore (in cooperation with North Sea energy cooperation) and addressing other issues with cross-border implications that may arise from the transition to a decarbonised electricity system.

Hydrogen

In 2020, a dedicated Hydrogen Support Group was set up to drive Penta's activities and close cooperation on hydrogen. SG4 focused on regulatory and market developments regarding the use of hydrogen in the Penta countries, in compliance with national, European and international rules. Building on the political declaration signed in 2020 on the role of hydrogen in decarbonising the energy system in Europe and recent developments, including REPowerEU and the International Energy Agency's 10-point plan to reduce the

The European Union's dependence on Russian natural gas, the Penta countries

exchange information and define common positions on the future market design for developments regarding the use of hydrogen. The SG4 will focus in particular on the development of hydrogen certification, the emerging hydrogen infrastructure in the Penta region and the steps needed to develop cross-border links, and will monitor progress in the implementation of the Penta countries' hydrogen strategies, including regulatory development, support mechanisms, investments, supply and demand developments, and trade.

NSEC JOINT CHAPTER FOR NATIONAL ENERGY AND CLIMATE PLANS

North Sea Energy Cooperation – Regional cooperation on offshore renewable energy

Germany is one of the larger North Sea regions with significant renewable energy potential. Offshore wind will play an increasingly important role in achieving Europe's energy and climate goals. The EU Offshore Strategy has set an ambitious target of 300 GW of offshore wind capacity and 40 GW of ocean energy by 2050. On 19 January 2023, the North Sea Energy Cooperation (NSEC) enabled the development of a non-binding agreement on the targets for offshore renewable energy production by 2050, with intermediate steps in 2040 and 2030, for the priority North Sea offshore grid corridors under the TEN-E Regulation. The objectives for the North Sea Offshore Grid Corridor (NSOG) are 60.3 GW in 2030, between 134.9 GW and 158 GW in 2040 and between 171.6 and 218 GW in 2050. The offshore sector, renewable energy deployment and integrated offshore strategic development will thus have a much wider dimension. High energy prices, such as 2022 and geopolitical events threatening the European energy system, have highlighted the need to accelerate the roll-out of domestic renewable energy generation capacity and regional offshore transmission grids as soon as possible to significantly enhance energy security.

Germany is working with the other NSEC countries to identify, analyse and implement opportunities for concrete cooperation projects. NSEC is a voluntary, bottom-up and market-oriented regional cooperation initiative established in 2016 with the following objectives:

- Create synergies;
- Avoid incompatibilities between national strategies;
- Exchange knowledge on international best practices;
- Promote common strategies where possible and useful.

Energy ministers meet regularly in the framework of NSEC. In 2023, NSEC is composed of Belgium, Denmark, France, Germany, Ireland, Luxembourg, the Netherlands, Norway and Sweden, with the participation of the European Commission. On 18 December 2022, the Energy Ministers of the NSEC and the EU Commissioner for Energy signed a Memorandum of Understanding on cooperation with the United Kingdom in the field of offshore renewable energy. This Memorandum of Understanding is based on the Trade and Cooperation Agreement between the European Union and the United Kingdom of 30. December 2020, builds on NSEC and is a stand-alone and at the same time complementary action to the existing NSEC framework.

For the offshore wind sector, a predictable and long-term stable operating

environment is essential to enable long-term investments and further cost reductions. To this end, existing barriers need to be removed and attractive investment conditions created. The NSEC members together play an important role in achieving these objectives by regularly exchanging expertise in the four NSEC Support Groups (SGs) on various topics:

- SG1: Development of hybrid and community projects;
- SG2: Permits, maritime spatial planning and environmental aspects;
- SG3: Funding and funding framework;
- SG4: Long-term network and infrastructure planning.

In order for each Support Group to achieve its objective, exchanges between and within the Support Groups will be strongly encouraged and managed at the level of the NSEC Coordinators. Examples include offshore wind farms (SG1 and SG4), maritime spatial planning and grid planning (SG2 and SG4) and how non-price criteria can stimulate innovation in relation to the main challenges for an accelerated, cost-effective and responsible deployment of offshore wind energy (SG1, SG3 and SG4). Finally, the Support Groups also work closely with other international fora, such as the Pentilateral Energy Forum and the Clean Industrial Forum, in the planning of onshore networks, market organisation and stakeholder engagement.

Development of hybrid and community projects

The SG1 of the NSEC acts as a platform for cooperation on concepts for potential offshore wind projects and coordinated electricity infrastructure, including transmission infrastructure. With the increasing number of joint and hybrid projects of the NSEC countries, the Group has stepped up its activities in the North Sea region to accompany discussions at technical and inter-ministerial level and the exchange of best practices as the project progresses.

In addition to joint multi-country offshore wind projects, the Support Group is also working on potential 'hybrid' solutions with cross-border options to connect offshore wind farms to more than one electricity market and achieve synergies between countries; the Support Group also deals with the relevant EU and national market regulations.

Therefore, SG1 members are developing ways to work together on hybrid projects and to overcome possible legal, regulatory and distributional barriers. The SG1 will continue to work on the removal of barriers and steps for hybrid and joint projects that can be implemented at national and regional level. In addition, cooperation will continue to serve as a forum to reflect on how to address issues related to legislative processes at EU and national level.

Permits, maritime spatial planning and environmental aspects

To achieve our energy and climate objectives in the EU, we need planning and permitting procedures at EU and

accelerate the national level while at the same time better understanding the possible ecological limits of large scale wind expansion in the North Sea and the impact on other marine users. SG2 carried out an inventory of spatial tensions in the development of offshore wind farms in 2030 at regional level. The next steps are to better define environmental tensions and potential threats to development and to define spatial strategies to prevent or reduce such threats. In order to increase knowledge and support the deployment of offshore wind in the North Sea, North Sea countries will continue to work closely with the relevant authorities for energy, maritime spatial planning and the environment in the areas of maritime spatial planning, environmental research and cumulative impact assessment of wind farms.

Funding and support framework

Offshore tenders are a key issue in terms of funding and support framework. NSEC members coordinate offshore tenders by exchanging information on national tender schedules in the framework of SG3. In the working group, countries also exchange best practices on participation in tenders, zero subsidy support, design elements to promote system and sector integration, and grid connection arrangements. In order to achieve the ambitious goals, joint projects are becoming increasingly important.

For this reason, the group also addresses funding opportunities for joint cross-border offshore projects, including through EU funding instruments, such as the Connecting Europe Facility and the EU renewable energy financing mechanism. Finally, Power Purchase Agreements (PPAs) play an increasingly important role in financing offshore projects. Countries will address the problems, obstacles and solutions for wider acceptance of the PPAs. The group will also exchange views on decommissioning, extension of operation and conversion of wind farms.

The aim of the exchange is also to jointly develop and discuss ideas for the medium-term future of the offshore energy system in terms of installed capacity, e.g. through coordinated tender plans.

2050 time horizon: Long-term network and infrastructure planning

The NSEC-SG4 cooperates with ENTSO-E to provide and coordinate contributions to the offshore network development plan for the Northern Seas offshore grids under the EU TEN-E Regulation. In addition, the SG4 intends to broaden the discussion on long-term network planning to include the early development and expansion of offshore hydrogen production and hydrogen transport, as well as their potential role in an increasingly interconnected North Sea energy system. Hydrogen will play an important role in decarbonising our energy system. Power-to-X, and hydrogen in particular, will

play a key role in providing flexibility where and when it is needed. Demand for hydrogen is expected to increase significantly, especially after 2030, both because of its potential as a storage energy carrier and as a fuel and raw material for hard-to-electrify.

Areas. Several NSEC countries have announced targets for the production of green hydrogen on land and at sea. In the SG4 the NSEC countries will share initial experiences with hydrogen related to offshore wind, as well as knowledge on transport infrastructure, renewable energy development and offshore power-to-X production. They will work together to gain insights on offshore hydrogen production, discuss the deployment of electrolysis and increase synergies between the long-term planning of offshore and hydrogen networks. In all aspects of medium and long-term infrastructure planning, the SG4 underlines the importance of full engagement in this planning process with Member States and relevant stakeholders, including industry and the Non-governmental organisations to anticipate and address supply chain bottlenecks (e.g. development and availability of wind farms) in deploying and accelerating the deployment of our North Sea energy system. This is closely linked to the

The importance of protecting the security of offshore and underwater critical infrastructures and the supply of critical raw materials through innovation and improved circular economy.

1.4.ii. Explanation of how regional cooperation is considered in the plan

The energy transition and advancing climate change can only succeed if they are embedded in Europe and strengthened through regional cooperation. Therefore, regional cooperation in the form of bilateral cooperation or joint initiatives and forums with several EU Member States is a key component of the Federal Government's energy and climate policy. This chapter is further specified with a view to drawing up the Federal Government's final energy and climate plan. An overview of some of the key existing regional cooperation with European partners, which can be found in the NECP draft at the relevant regional cooperation points:

Bilateral cooperation

The Federal Government maintains close cooperation on energy and climate policy with many other EU Member States, in particular its direct neighbours. With some Member States, this cooperation has been reinforced and made more concrete by the Memorandum of Understanding (MoU). In the current legislature, for example, the already existing and very good energy and climate cooperation between France and Germany under the German-French Declaration of January 2023 has been strengthened and extended with Poland through the newly created German-Polish Energy Platform. Cooperation projects with France are established, inter alia, in the Franco-German Energy Platform, the internal energy market and energy research (see Chapter 3.2., 3.4.3., 3.5.). In addition, there is an intensive exchange of knowledge and experience within the framework of the German-French Office for the Energy Transition (DFBEW). There are solidarity agreements on gas supplies with several

European countries.

European Climate Action Initiative

The European Climate Change Initiative (EUKI) is a BMWK funding initiative to strengthen European cooperation in the further development and implementation of ambitious climate policy. EUKI finances non-investment climate projects, in particular by civil society and sub-national administration in Europe. Themes for EUCI bi- and multilateral projects are the development of climate strategies and their implementation at different levels of exchange on climate policy instruments, actions and projects in the relevant sectors: Climate policy, energy transition and climate neutral buildings, mobility, just transition, carbon removal and sustainable economy. In addition to project implementation, EUKI aims at knowledge and Exchange of experience between project organisations and with other experts in the field of climate change.

Baltic Energy Market Interconnection Plan (BEMIP)

BEMIP has existed since 2009 and includes all EU Baltic Sea countries and Norway as observers and is mainly organised by the European Commission. The Federal Government participates in the BEMIP working groups (see Chapter 3.1.2.).

North Seas Energy Forum (NSEC)

In 2016, the North Seas countries, as well as the EU Commission, set up the North Seas Energy Forum to further develop their energy cooperation.

This forum will focus on cooperation on the development of offshore wind energy and the development of the

Grid infrastructure and maritime spatial planning in the North Sea. As part of the initiative, the relevant Member States, including the Federal Republic of Germany, have also started to exchange with the relevant parts of the NECPs of the North Sea States and to develop common NECP elements (see Chapter 3.1.2., 3.5.) The next NSEC Annual Conference will be hosted by Germany in 2025.

Pentalateral Energy Forum

This is a cooperation between Member States since 2005 between Belgium, Luxembourg, the Netherlands, France, Austria and Germany.

it focuses on electricity, security of supply, crisis preparedness and flexibility of electricity markets. Switzerland has observer status in the Forum (see chapter 3.4.3.).

Pentalateral Gas Forum

This is a cooperation between Belgium, Luxembourg, the Netherlands, France and Germany, which has been in place since 2009, focusing on gas supply issues (see

chapter 3.3.).

Cooperation in Transeuropean Networks Energy (TEN-E regional groups)

The Federal Government cooperates with other Member States in several regional groups under the TEN-E. The regional groups correspond to the energy infrastructure priority corridors defined in the TEN-E Regulation and are responsible for identifying projects of common interest (PCIs) at regional level for the development of energy infrastructure under the TEN-E Regulation. According to Article 4 of the TEN-E Regulation, the projects concerned are intended to contribute, inter alia, to market integration, sustainability, competition (diversification of supply sources, routes and suppliers) and security of supply (see Chapters 3.3 and 3.4.3.).

Major North Sea Basin Initiative (GNSBI)

France and the Netherlands launched the Greater North Sea Basin Initiative (GNSBI) in 2023, in which the federal government actively participates. With GNSBI, North Sea riparians, including the United Kingdom and Norway, intend to step up cross-sectoral cooperation on energy, environment, fisheries and spatial planning in order to develop the North Sea in a coordinated manner.

2. NATIONAL OBJECTIVES AND TARGETS

2.1. Decarbonisation dimension

2.1.1. Greenhouse gas emissions and removals;

The elements set out in point (a)(1) of Article 4

Binding annual national limit values under the EU Climate Sharing Regulation (ESR)

In order to achieve the EU climate target (min. -55 % netgreenhouse gas reduction) for 2030, the European Parliament and the European Council have also revised the EU's Effort Sharing Regulation (ESR) and the LULUCF Regulation. The EU Climate Change Regulation now sets a binding reduction target for Germany of -50 % compared to 2 005 in 2030 (instead of 38 % so far) for the non-ETS sectors, i.e. transport, buildings, agriculture, smaller energy production and industrial installations, waste. Annual Emission Allocations (AEA) quantities In 2021 and 2030, on the basis of the empowerment under the ESR, Article 4(3) shall be laid down in implementing acts. Implementing Decision (EU) 2020/2126 (as last amended by Implementing Decision (EU) 2023/1319 of 28 June 2023) provides for the following annual emission

allocations for Germany in tonnes of CO₂equivalent for the period from 2021 to 2025:

- 2021: 427306142
- IN 2022: 413224443
- 2023: 391872325
- 2024: 370518122 • 2025: 349163918.

For the years 2026-2030, the national annual emission allocations will be determined by further implementing acts in 2025.

Assurances under the Land Use, Land Use Change and Forestry (LULUCF) Regulation

As part of the European Fit-for-55 package, the LULUCF Regulation has been revised. Member States will receive a difference target for 2030 and a budget target for the period 2026-2029. For the period 2021-25, the current targets of the LULUCF Regulation continue to apply, with direct debits from the land use categories taken into account in accordance with Article 2 together not exceeding the credits at the end of the five-year period from 2021 to 2025 ('no net debit rule'). From 2026 onwards, the Regulation sets absolute sink targets for each Member State, which are expressed as an improvement compared to the 2016-18 base period. According to the current assessment, the 2030 differential target (improvement of the sink by 3.8 Mt CO₂equivalent) and the budget target 2026-2029 are in line with the target of the Federal Climate Protection Act (KSG) for the LULUCF sector (improving the sink to 25 Mt CO₂equivalents on average for the years 2027-30). It should be borne in mind that the PSC's 2030 target cannot easily be compared with the EU LULUCF target, as both targets differ in the calculation method and in the data base.

For the years 2037 to 2040, the KSG sets a target for the LULUCF sector of an average annual emissions balance of minus 35 million tonnes of CO₂ equivalent per year and for the years 2042 to 2045 the target for the average annual emissions balance is minus 40 million tonnes of CO₂ equivalents.



Projected evolution of the net balance of the LULUCF sector without measures (OMS), measures (MMS) and other measures (MWMS). The solid line represents the 2024 projection data.

Source: Eco-Institut et al: Projection report 2024 for Germany

According to 2024 projection data (see table), the net balance of the LULUCF sector in the MMS in 2030 is -1.3 Mt CO₂eq.; in 2040, it stands at -0.2 Mt CO₂eq and 1.6 Mt CO₂eq in 2045. In MWMS, the net balance in 2030 is 2.2 Mt CO₂eq; in 2040, it is -3.1 Mt CO₂eq and -2.3 Mt CO₂eq in 2045. The targets set out in the KSG for the LULUCF sector will not be met in either scenario. The LULUCF sector will not become a permanent net sink of greenhouse gases in any scenario. Only the MWMS achieves a sink throughout 2029 to 2049. The significant difference with the projections of the 2023 Projection Report is a consequence of the methodological improvements in emissions reporting (taking into account methane emissions from artificial waters, regionalisation of soil carbon stocks) between 2022 and 2024. As a result, from the 2023 inventory reporting onwards, additional GHG emissions will be recorded in the LULUCF sector, which could not be accounted for so far for methodological reasons.

The 'Natural Climate Action Programme' (ANK) was not sufficiently specific and operationalised when the projections were prepared, so that it could not be fully taken into account.

Significant GHG mitigation measures for the LULUCF sector, largely implemented through the 'Natural Climate Action Programme' (ANK), include, inter alia, the rewetting of

peatlands, the reduction of peat use in growing media, the creation of species-rich and climate-resilient forests through restoration and forest conversion, financial incentives for additional forest climate and biodiversity services; the stop of felling in old beech forests, the limitation of the use of new land for settlement and transport purposes, the setting up of compensatory land for sealing by increasing wind power and open-air PV, and other measures, in particular in the context of the ANK. The ANK provides for measures in ten areas of action, including bogs, forest ecosystems, water and water balance, oceans and coasts, settlement and transport areas.

In order to achieve the objectives set out in Section 3a KSG, the programme focuses primarily on voluntary measures and corresponding support measures. Landowners or land managers should be supported by financial incentives to convert the management of their land in a way that contributes to improving the emissions balance in the LULUCF sector. The ANK's funding guidelines, which have already been published, are in high demand for the funding offered.

The implementation of the ANK's measures takes time because the two core areas (bog and forest) are very large-scale support measures.

In order to be as effective as possible, funding guidelines must also take into account the different framework conditions for support programmes by the Federal Government and, in some cases, by the Länder. In addition, support programmes – particularly in areas where agricultural or forestry holdings are addressed, such as the rewetting of drained peatlands used for agriculture – must be examined for their relevance under State aid law and, where appropriate, notified to the European Commission.

In addition to support measures, the ANK provides for a wide range of measures which work together in synergy and support the success of the support measures. In addition to accompanying research, monitoring and capacity building, this includes accompanying measures such as the acquisition of specialised equipment and technology, communication and education, structural building measures and the creation of framework conditions, such as the review of the legal framework with the aim of identifying obstacles to implementation in the field of bog protection.

In addition, ANK includes an intrinsic mechanism for regular reporting and follow-up of the programme: “By 2025 at the latest, the Federal Government will draw up and publish a report on the state of implementation of the ANK and the impact of the measures in terms of effective greenhouse gas savings and other objectives of the action programme, if possible on the basis of measurable indicators. In this framework, we will evaluate the measures implemented and review the need for adaptation. [...] In particular, the trends in LULUCF emissions balances shall be taken into account. If the emissions projections show that the targets for the LULUCF sector are likely to be missed, the measures in the Natural Climate Action Programme will be adapted to make a substantial contribution to closing the gap. This review and adjustment shall be carried out every two years on the basis of the latest projection report. An evaluation should also be carried out taking into account the further

development of the EU climate framework.”

Further details on the ANK and the main measures are described in chapter 3.1.1.i in the section Agriculture, Land Use Change and Forestry.

The German LULUCF inventory is based on geographically specific land-use change data. In areas where Germany has not yet reached the specific level of reporting required in the future, the necessary research and implementation requirements are currently being examined. In order to ensure future compliance with the reporting requirements, the European Commission needs action to be taken. For

Where the LULUCF Regulation requires Tier 3 methods only in certain areas, Germany plans to apply Tier 3 methods for its entire territory. To make this possible, numerous monitoring measures and research projects, such as forest inventories, soil inventories, development of remote sensing devices, etc., are already ongoing.

Where applicable, other national objectives and targets consistent with the Paris Agreement and the existing long-term strategies. Where applicable for the contribution to the overall Union commitment of reducing the GHG emissions, other objectives and targets, including sector targets and adaptation goals, if available

Germany has set itself the objective of achieving net-zero greenhouse gas emissions by 2045 in the Federal Climate Protection Act. Greenhouse gas emissions should be reduced by at least 65 % by 2030 and by at least 88 % by 2040 compared to 1990 levels. This is even more ambitious than the European targets for achieving climate neutrality by 2050 and a net reduction in greenhouse gas emissions of at least 55 % by 2030.

In accordance with the first sentence of Section 15(1) of the Federal Climate Protection Act, the Federal Government has set itself the objective of organising the federal administration in a climate-neutral manner by 2030.

2.1.2. Renewable energy

2.1.2.1. The elements set out in point (a)(2) of Article 4

The rapid roll-out of renewable energies is key to achieving climate change objectives and ensuring affordable and secure energy supplies. On 20 November 2023, the revision of the Renewable Energy Directive entered into force with more ambitious targets. For example, the share of renewable energy in the EU should be raised to at least 42.5 % of gross final energy consumption by 2030, but the target should be as high as 45 % (see Chapter 5.1.i for the German target). For Germany, this also means: the development of renewable energies and their use must be stepped up massively in order to meet European requirements.

The revision of the Renewable Energy Directive entered into force on 20 November 2023. It must be implemented by the European Member States within 18 months. It sets a common target of 14.5 % greenhouse gas savings for all transport by 2030.

In order to help limit climate warming to 1.5 °C, the Federal Government adopted a comprehensive legislative amendment on energy policy in April 2022. The new Renewable Energy Act (EEG 2023) sets higher expansion targets for wind and solar energy and gives the expansion of renewable energy in planning processes legal precedence over other interests to be weighed, provided that no national and alliance defence interests are involved. By 2030, at least 80 % of Germany’s gross electricity consumption should come from renewable energy sources. The expansion paths for wind and solar energy will be significantly increased: The deployment target for offshore wind energy increases to at least 30 gigawatts (GW) by 2030, to at least 40 GW by 2035 and to at least 70 GW by 2045. In the case of onshore wind, 10 GW of installed capacity is expected to be added each year to reach a total of 115 GW by 2030 and 160 GW from 2040, and 22 GW per year for solar installations to reach a total of around 215 GW by 2030 and 400 GW by 2040.

2.1.2.11. Estimated trajectories for the sectoral share of renewable energy in final energy consumption from 2021 to 2 030 in the electricity, heating and cooling, and transport sector

Electricity

In 2022, renewable electricity generation in Germany (in line with Directive 2018/2001) is based on the pillars of onshore wind (102.5 TWh), solar power (60.3 TWh), wind at sea (26.6 TWh), hydro (19.9 TWh) and biomass (51.3 TWh) (including other renewable energies). This resulted in a total of 2 022 260.6 TWh of renewable electricity (corresponding to EU Directive 2018/2001), which resulted in a share of renewable energy in gross electricity consumption (corresponding to Directive 2018/2001) of 47.6 %.

Three technologies will become future technologies.

Identified growth technologies for which expansion paths were laid down in Section 4 of the 2023 EEG and Section 1(2) of the WindSeeG.

Onshore wind turbines (st. Power in GW)

IN 2023	2019 TO	2025	2026	2027	2028	2029	2030
—	69	—	84	—	99	—	115

Offshore wind turbines (st. Power in GW)

IN 2023	2019 TO	2025	2026	2027	2028	2029	2030
—	—	—	—	—	—	—	30

Solar panels (initially) Power in GW)

IN 2023	2019 TO	2025	2026	2027	2028	2029	2030
—	—	—	—	—	—	—	—

—	88	—	128	—	172	—	215
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There is no substantial growth potential for renewable electricity generation from biomass and hydropower, which reduces their contribution to achieving the target proportionally.

Based on the expansion targets, a renewable electricity trajectory is derived (electricity generation in TWh; Section 4a EEG 2023).

IN 2023	2019 TO	2025	2026	2027	2028	2029	2030
287	310	346	388	433	479	533	600

Under Section 1 of the 2023 EEG, a renewable share of 80 % of gross electricity consumption is therefore to be achieved by 2030.

Accordingly, the gross electricity consumption for 2030 is:
750 TWh adopted.

Heating and cooling supply

In the heating and cooling sector, buildings account for the largest share of energy consumption (about two thirds of final energy consumption for heating and cooling), but process heating and cooling also play a crucial role in industry (around one third of final energy consumption for heating and cooling).

At European level, the recast of the Renewable Energy Directive requires Member States to increase the share of renewable energy by 0.8 percentage points per year as an annual average for the period from 2021 to 2025 and an annual average of 1.1 percentage points from 2026 to 2030.

In addition, each Member State shall endeavour to increase the share of renewable energy in its heating and cooling sector by the additional benchmark set out in Annex Ia of the Directive, expressed in percentage points. For Germany, a benchmark of 1 percentage point per year as an annual average for the period from 2021 to 2025 and 0.7 percentage points as an annual average for the period 2026 to 2030, resulting in an annual increase of 1.8 percentage points as an annual average for both periods from the binding target and the indicative benchmark.

As a result of these trajectories, Germany has to achieve a share of 18 % in 2025 and aims at a share of 23 % in total. A share of 23.5 % has to be achieved for 2030 and Germany's overall target is 32 %. This level of ambition for the heating and cooling sector is taken by the Federal Government as the basis for its contribution to the achievement of the EU's 2030 targets.

Member States may count waste heat and cold and renewable electricity used for heating and cooling towards the binding average annual increases up to a limit of 0.4 percentage points. In that case, the binding target for the average annual increase shall increase by half of the percentage points of waste heat and cold or used renewable electricity up to a limit of 1,0 percentage points for the period 2021-2025 and 1.3 percentage points counted for the period 2026-2030. The use of waste heat and cold and the electrification of heating and cooling are important building blocks for the decarbonisation of heating and cooling in Germany. The Federal Government therefore intends to use waste heat and cold in the future and for heat and

Count electricity used for cooling. To this end, the necessary legal and data bases are being put in place so that accounting can be made for the period from 2026 to 2030.

Against this background, the estimated amount of waste heat and cold in 2030 is around 7 TWh per year. The supply potential for waste heat from the manufacturing sector is estimated at 4.8 TWh, taking into account the transformation of the sectors concerned and the usability of heat networks. In addition, data centres are expected to have a waste heat utilisation potential of 2 TWh in 2030. This results from an increase in the energy consumption of data centres to 25 TWh/a in 2030, of which one third of the increase in energy consumption of around 7 TWh/a could be used as waste heat. Assuming an energy demand in heating and cooling of around 1 400 TWh/a, waste heat and cold would account for 0.4 %, which would result in an increase in the target of 0.2 %. The actual target increase shall be determined once the waste heat and cold consumed for the period 2026 to 2030 is established.

The capacity of large heat pumps (i.e. above 500 kW heating capacity) is estimated at 2.1 GW electrically and 6.3 GW thermally for 2030. The capacity of decentralised heat pumps (i.e. with heating capacity below 500 kW) is thermally estimated at 57.6 GW in 2030.

	IN 2020	2025	2030
Binding trajectory under Article 23	14 %	18 %	23.5 %
Overall trajectory under Article 23 (binding and indicative)	14 %	23 %	32 %

2.1.2.111. Estimated trajectories by renewable energy technology that the Member State projects to use to achieve the overall and sectoral trajectories for renewable energy from 2021 to 2030, including expected total gross final energy consumption per technology and sector in Mtoe and total planned installed capacity (divided by new capacity and repowering) per technology and sector in MW

Warmth

For large heat pumps (i.e. with a thermal capacity above 500 kW) an estimated 4 GW per year in heat networks is needed to reach the climate neutrality objective in 2045. At present, production is still less than 1 GW per year. The total power of large heat pumps in Germany was around 60 MW at the beginning of 2023. In 2030, large heat pumps are expected to generate 86 TWh per year in heating networks.

Heat pump offensive

The key technology to renew decentralised heat production is heat pumps. On the basis of a decision by the Federal Government, the Federal Ministry of Economic Affairs and Climate Protection (BMWK) launched a heat pump offensive in summer 2022. In the context of the first heat pump summit, hosted by the BMWK and the Federal Ministry of Housing; Urban development and construction (BMWSB), together with representatives from industry, crafts, real estate, trade unions and academia, signed a Memorandum of Understanding to re-install at least 500.000 heat pumps per year as of 2024.

2.1.3. iv. Estimated trajectories on bioenergy demand, disaggregated between heat, electricity and transport, and on biomass supply by feedstocks and origin (distinguishing between domestic production and imports). for forest biomass, an assessment of its source and impact on the LULUCF sink

Table. Projected consumption of biomass fuels by sector in 2030 and 2045 with measures (MMS) and additional measures (MWMS)

Type of biomass	Sector	MMS 2030	MMS 2045	MWMS 2030	MWMS 2045
Solid biomass-fuels	EnergyEconomy	178	267	178	268
	Industry	184	253	174	244
	Buildings	517	511	489	448
	Farmers	7	8	7	8
	<i>Between total</i>	886	1.039	847	968
Gaseous biomassfuels	EnergyEconomy	155	121	155	124
	Buildings	38	85	40	88
	Traffic	1	0	1	0
	Farmers	13	12	13	12

Type of biomass	Sector	MMS 2030	MMS 2045	MWMS 2030	MWMS 2045
	<i>Between total</i>	207	217	209	223
Liquid biomass-fuels	Buildings	3.35	12,46	3.37	12,28
	Traffic	130	38	129	37
	Farmers	6	6	6	6
	<i>Between total</i>	140	57	139	56
Overall		1.232	1.313	1.195	1.247

Data source: Öko-Institut et al., Projection Report for Germany, Table 28

According to projection data 2024 (UBA 2024c), biomass fuel demand of 1.195.232 PJ is assumed for 2030, with domestic sources capable of supplying 837-838 PJ. For 2045, demand for biomass fuels is assumed to be between 1.247 and 1.313 PJ, with only 875-786 PJ being available from domestic sources.

Table. Projected consumption of biomass fuels by origin and potential import needs in 2030 and 2045 with measures (MMS) and additional measures (MWMS)

Type of biomass	Origin	MMS 2030	MMS 2045	MWMS2030	MWMS 2045
Solid biomass-fuels	Projected energy wood coming from domestic logging, including. Forest energy wood sorted (slit wood, wood chips) and industrial residual hol z of firstprocessing	PJ 253	271	253	271
	Projected energy wood from further industrial residual z and waste wood	273	276	273	276
	Estimation of other solid biomassfuels from biogenic residual and waste raw materials (DBFZ data, 2015 situation)	67	67	67	67

Type of biomass	Origin	MMS 2030	MMS 2045	MWMS2030	MWMS 2045
Gaseous biomassfuels	Potential import needs* solid biomassfuels	292	424	254	354
	Projected biogas-generated from crop biomass*	77	54	77	54
	Projected biogas-generated from excrement n*	42	39	42	39
	Estimation of gaseous biomass-fuels from biogenic residual and waste raw materials (DBFZ data, 2015 situation)	55	55	55	55
	Potential import needs* of gaseous biomassfuels	32	69	34	75
Liquid biomass-fuels	Projected biofuel-coming from crop biomass (corresponding to demand)	66	20	65	19
	Estimation of liquid biomass	3	3	3	3

Type of biomass	Origin	MMS 2030	MMS 2045	MWMS2030	MWMS 2045
	fuels from biogenic residual and Waste raw materials (DBFZ data as at 2015)				
	Potential import needs* liquid biomassfuels	71	34	70	34
Overall		1.232	1.313	1.195	1.247
<i>of which domestic</i>		838	786	837	785
<i>of which potential imports</i>		394	527	358	462

Data source: Öko-Institut et al., 2024 projection data for Germany

The Federal Government is currently preparing the National Biomass Strategy (Nabis) to set the framework conditions for a climate-friendly and resource-efficient Production and use of biomass. Priority should be given to the material use of biomass over energy use.

2.1.2. v. Where applicable, other national trajectories and objectives, including those that are long term or sectoral (e.g. share of renewable energy in district heating, renewable energy use in buildings, renewable energy produced by cities, renewable energy communities and renewables self-consumers, energy recovered from the sludge acquired through the treatment of wastewater)

Share of renewable energy in heating networks pursuant to Article 24(4) of the Renewable Energy Directive

According to the recast Renewable Energy Directive, Member States aim to increase the share of renewable energy

Energy and waste heat and cold by 2.2 percentage points per year as an annual average for the period from 2021 to 2030.

As electrification of heat production is an important building block for the decarbonisation of district heating and cooling, the Federal Government intends to count electricity from renewable sources towards the targets in district heating and cooling. Renewable electricity capacity for district heating and cooling is estimated at 2.1 GW electrical and 6.3 GW thermally in 2030.

The share of renewable energy and waste heat in district heating in Germany was around 23 % in 2020. On this basis, an increase to around 45 % renewable energy and waste heat in 2030 can be calculated using a trajectory compatible with the RED.

The Act on Heat Planning and Decarbonisation of Heat Networks (WPG), which entered into force on 1 January 2024, aims to make a significant contribution to the transition towards, inter alia, cost-effective, affordable and greenhouse gas neutral heating by 2045. According to WPG, a national average of 50 % of renewable energy and waste heat must be achieved by 2030. Each individual heat network shall achieve a share of 30 % renewable energy or waste heat by 2030 and 80 % by 2040. The full decarbonisation of heating networks is foreseen by 2045.

Use of renewable energy in buildings – indicative national target in accordance with Article 15a of the Renewable Energy Directive

In line with the requirement of the new Article 15a of the Renewable Energy Directive to meet the EU-wide target of a renewable share of 49 % in final energy consumption in the buildings sector in 2030, Germany sets an indicative target corridor of between 46 % and 50 % as a national contribution. This pathway essentially refers to the ‘polluter pays’ principle and thus includes the share of renewable energy in the electricity mix and district heating production, in addition to near-building energy production. A more precise definition is not possible in view of the missing guidance on the calculation of the indicator. Against this background too, the Federal Government reserves the right to clarify the indicative target when drawing up the National Renovation Plan.

In addition to measures to decarbonise electricity and district heating production (see 3.1.2), the requirement for the renewable share of heat used in buildings, which entered into force on 1 January 2024 with the amended Buildings Energy Act, is an important element in achieving the 2030 benchmark (see 3.1.2).

Share of renewable energy in industry in accordance with Article 22a of the Renewable Energy Directive

In 2020, the share of renewable sources in the energy sources used for final energy and non-energy purposes in the industrial sector was around 14.3 %, in 2021 around 15.0 % and in 2022 around 16.3 %. Based on the 2020 value, the indicative trajectory would be the following.

	IN 2020	2025	2030
Indicative trajectory in accordance with the first subparagraph of Article 22a(1). 1	14.3 %	22.3 %	30.3 %

2.2. Energy efficiency dimension

2.2.1. The elements set out in Article 4(b)

National contributions to the Union 2030 target

On 10 October 2023, the amendment to the EU Energy Efficiency Directive (EED) entered into force. It provides for an 11.7 % reduction in final energy consumption in the EU by 2030, compared to the estimated final energy consumption in 2030 in 2020. This means a binding cap of 763 Mtoe (or 8.874 TWh) on final energy consumption at EU level. For the Primary energy consumption has been capped at an indicative level of:

992.5 Mtoe (or 11.543 TWh) decided at EU level. All EU Member States are expected to contribute to the achievement of the targets by providing indicative trajectories for 2030 in their National Energy and Climate Plans.

On 18 November 2023, the Energy Efficiency Law entered into force a cross-sectoral energy efficiency framework supporting the implementation of the obligations under the EED (see also Table A1).

Germany's target contributions to primary and final energy consumption for 2030 are derived from the Energy Efficiency Act. The basis for the target calculation was the EU Reference Scenario 2020 and the calculation method according to the formula in Annex I to the EED. Germany's reported targets for 2030 are 2.252 TWh (or 193,64 Mtoe) for primary energy consumption and 2.1809 TWh (or 155,55 Mtoe) for final energy consumption, in line with the new Eurostat methodology applied in the EED.

For the 2024-2030 period, the following indicative trajectories are provided:

Primary energy consumption trajectory 2024-2030

Unit sector	2024	2025	2026	2027	2028	2029	2030	
Industry	TWh	862	842	814	787	759	731	704

²The final energy consumption target in the Energy Efficiency Act took into account the net energy input for energy conversion into blast furnaces. On the other hand, according to the new Eurostat methodology used in the EED, the energy consumption of blast furnaces is only reflected in primary energy consumption. The final energy consumption target in the EnEfG includes a flat rate of 5 Mtoe (or 58.15 TWh) for the consumption of blast furnaces in 2030. If the new Eurostat method used in the EED is used, Germany's target of 1.867 TWh will be reduced by this figure to 1.809 TWh.

GHD	TWh	421	402	378	353	329	305	281
Households	TWh	779	756	722	689	655	621	588
Traffic	TWh	768	781	761	741	720	700	680
Sum	TWh	2830	2780	2675	2569	2463	2358	2252

Final energy consumption trajectory 2024-2030

Unit sector	2024	2025	2026	2027	2028	2029	2030	
Industry	TWh	576	573	562	551	541	530	520
GHD	TWh	312	306	289	273	256	240	224
Households	TWh	635	614	586	559	531	504	476
Traffic	TWh	710	715	690	665	640	615	589
Sum	TWh	2233	2208	2128	2048	1968	1889	1809

The calculation of the indicative trajectories is based on the assumption that the contributions will be achieved in 2030 and that many energy savings will take place towards the end of the decade. The background is the expected significantly higher efficiency gains from 2027 onwards due to the ongoing technological transformation, which allows for much higher efficiency gains than in the past. In addition, there is a change in the framework conditions, in particular with the extension of the European Emissions Trading Scheme to the buildings and transport sectors (ETS II) as of 2027. ETS II will provide an additional incentive to use energy more efficiently through its price signals.

The distribution of energy consumption targets between sectors has been based on the projected percentage distribution of energy consumption among end-use sectors in the 2024 projection report in the co-continuation scenario for 2030. Accordingly, the target for primary energy consumption for 2030 of 2252 TWh is divided as follows: Industry (704 TWh or 31.26 %), trade, commerce and services (GHD) (281 TWh or 12.48 %), households (588 TWh or 26.11 %), transport (680 TWh or 30.2 %). The final energy target for 2030 of 1809 TWh is divided into the end-use sectors as follows: Industry (520 TWh or 28.75 %), DHD (224 TWh or 12.38 %), households (476 TWh or 26.31 %), transport (589 TWh or 32.56 %).

In the field of information and communication technology, electricity consumption of 66.1 TWh is projected for 2030.

Cumulative energy savings under Article 8 of the EU Energy Efficiency Directive (EED)

The cumulative savings target under the new Article 8(1), first sentence, point (b) of the EED for the period 2021-2030 is 5 757.1 PJ or 137,51 Mtoe based on Eurostat statistical data. The previous target under point (b) of the first sentence of Article 7(1) was PJ 3996,5 or 95.46 Mtoe. It is notified on the basis of Annex III to Regulation (EU) 2018/1999 on the Governance of the Energy Union and Climate Action (concerning the notification of:

Measures and methodologies for the implementation by Member States of Article 7 of Directive 2012/27/EU). The notification required thereupon, together with the other necessary information, will depend on the present text in the form of an Excel spreadsheet as an annex in accordance with Article 3(2)(h) of Regulation (EU) 2018/1999. The determination of the savings target in accordance with point (b) of the first sentence of

Article 8(1) of the Energy Efficiency Directive is based on Eurostat data on final energy consumption in Germany from 2016 to 2018, as provided for in the Directive, which requires the use of data before 1 January 2019.

Public sector leadership in energy efficiency under Article 5 of the EU Energy Efficiency Directive (EED)

The baseline of all public entities for 2021 is 68.9 TWh. That baseline does not include public transport and the armed forces in accordance with the first subparagraph of Article 5(1). 3 P. 1 EED. Similarly, the baseline and the values of the individual sectors are estimates in accordance with the second sentence of Article 5(2) of the EED. The Energy Efficiency Act, which entered into force on 18 November 2023, transposes Article 5 of the Energy Efficiency Directive. Section 6 of the Energy Efficiency Act lays down an annual savings obligation of 2 % for public bodies. In this context, the law requires public bodies with consumption above 3 GWh/year to put in place an energy or environmental management system by 30 June 2026. Smaller public bodies consuming between 1 GWh/year and 3 GWh/year are required to put in place a simplified energy management system by 30 June 2026.

<u>Bund</u>	
Federal administration	TWh
<u>Countries</u>	
Courts	1.0 TWh
General administration of the Länder	TWh

Police	1.0 TWh
Science	6.7 TWh
Dwellings;	TWh
Business-related buildings	TWh
Cultural and other buildings	TWh
Penitentiary establishments	TWh
<u>Communes</u>	
Local government	TWh
Schools, Kitas, further training	18.9 TWh
Pools	TWh
Sports buildings	TWh
Youth centres/emergency building	2.0 TWh
Buildings, workshop building, fire brigade	TWh
Water/waste water	7.9 TWh
Street lighting	TWh
Museums/Cultural Buildings	TWh

Long-term renovation strategy in accordance with Article 2a of the Energy Performance of Buildings Directive (old version)

The building sector plays a central role in the energy transition and the achievement of the long-term climate policy objective. According to preliminary data for 2022, final energy consumption in the building sector for space heating, hot water and electricity consumption for lighting (excluding households) and climate cooling was 3.024 PJ (840 TWh). This represents around 35 % of total final energy consumption. Private households account for

two thirds of these at 2.021 PJ (562 TWh) and one third for trade, commerce and services and industry with a total of 1.002 PJ (278 TWh).

The direct emissions from the building sector (source principle) from the combustion of fossil oil, gas and tlw. Coal for space heating and domestic hot water heating amounted to around 102 MtCO₂eq in 2023, accounting for just under 15 % of the total emissions of 674MtCO₂eq.

responsible. In addition, the contribution of buildings is due to increased electricity demand for heating in the energy sector and emissions in the industry sector, mainly due to the process and manufacturing emissions associated with the construction and refurbishment of buildings. For example, the activity field for buildings is currently responsible for about 40 % of emissions in Germany. At the same time, they contribute to reducing emissions in the industrial and energy sectors by incentivising the use of sustainable building materials and practices and the increasing installation of building-side PV systems. Overall, this underlines the cross-sectoral importance of buildings for decarbonisation.

In order to achieve the climate policy objective, Germany's strategy is to reduce final energy consumption further and to increase the use of renewable energies and the cross-sectoral reduction potential in the field of action in buildings. Already in 2016, the buildings efficiency strategy set out this path in approaches, with important framework parameters having changed since then. A wide range of instruments must be used to achieve the objectives.

It is important to ensure that these measures are feasible, affordable, economically, technologically open, environmentally and – last but not least – reliable, durable and user-friendly, and always take into account the requirements of climate-adapted construction. Overall, they must not prevent the creation of much-needed housing. Social

Particular consideration should be given to impacts. Across sectors, further greenhouse gas savings can be achieved by reducing indirect emissions. These are generated by the production of building materials, components, plant engineering, etc. in the industrial sector. The transformation of the building sector towards full net zero greenhouse gas emissions requires measuring the life-cycle environmental impacts and resource consumption of buildings, thus incentivising the use of low greenhouse gas construction products and building materials. The Federal Government has already taken an important step in establishing the life-cycle assessment of the quality label for sustainable buildings (QNG) in the sustainability class of federal support for efficient residential and non-residential buildings (BEG WG and NWG) and in the support programme for climate-friendly new construction (KFN). In addition to promoting the use of resource-efficient building materials, circular construction, among other things, the selective dismantling of buildings and the recycling of building materials can also contribute to reducing energy demand. Themix of instruments should be based on a balanced link between carbon pricing as an instrument of increasing importance, regulatory requirements and accompanying, socially balanced support policies, complemented by other incentive instruments (e.g. fiscal measures).

With the long-term renovation strategy pursuant to Article 2a(2) of the EPBD (old version),

the Federal Government presented an overall strategy for the building stock. It provides a comprehensive overview of the building stock, tools and nationally planned measures.

The climate targets that have been adapted since the long-term renovation strategy was drawn up – both at EU and national level – are reflected in further developed and new measures. For example, the national target to achieve climate neutrality in 2045 is crucial for the transformation of the building sector. It represents a significant increase in ambition compared to the one still valid for the long-term renovation strategy. The amended national law on climate change shows an indicative annual emissions of 67 Mt CO₂ for the buildings sector in 2030. This benchmark will be used as part of the monitoring of total annual cross-sectoral emissions and sectoral emissions.

Annual emissions in case of gaps are used with 67 MtCO₂ more ambitious than the 70 Mt CO₂ set out in the Long-Term Renovation Strategy. The KSG also includes procedural provisions to help meet the specific ESR targets for the buildings and transport sectors.

This national target architecture is the basis for the Federal Government's projections and long-term scenarios and thus for defining new measures. The more ambitious, high-level targets for buildings are not translated into the 2030 milestone defined for the long-term renovation strategy, as the requirements for the National Renovation Plan under the amended EPBD require a revision of the transformation pathway, including corresponding milestones. The indicative targets are to be adjusted together with any necessary adjustments to the indicators used in the preparation of the National Renovation Plan.

The overall increase in ambition is also reflected in national, sectoral targets that influence the transformation of the building sector and vice versa and have been adapted (increased) or redefined since the long-term renovation strategy was drawn up. For example, the 2030 renewable electricity and district heating targets make an important contribution to accelerating the decarbonisation of buildings, which will at the same time significantly contribute to the ambitious targets of the energy sector.

The interplay of national policies and measures continues to focus on both increasing the use of renewable energies for heating, increasing their energy efficiency and reducing final energy consumption in the building sector, focusing more on cross-sectoral potential and reducing final energy consumption in the building sector.

The measures of the long-term renovation strategy are updated in Chapter 3. The savings associated with the implementation of the measures described therein are presented in connection with the obligation under Article 8 EED (see Annex on measures transposing Article 8 of Directive 2023/1791). In the corresponding detailed

Descriptions of the measures taken to transpose Article 8 of Directive 2023/1791) can also be found on costs (budget) if relevant information is available.

In particular, the 2023 Climate Action Programme shows the right measures for the set GHG reduction targets. It responds to the renovation strategy and adapts it to the

changed ambitions. The key challenge in the continuation of measures is an even more efficient and targeted use of existing financial resources, while taking into account social aspects, to ensure that the requirements can be met by all concerned.

For the first time, the Buildings Energy Act lays down basic rules on the use of renewable energy in all new heating systems: the '65 % rule' and the ban on fossil heating from 2045. These measures demonstrate the increase in ambition.

The amendment of the Buildings Energy Act and the revision of the EU Buildings Directive (EPBD) adapted key legal frameworks for the long-term renovation strategy. The Directive entered into force at the end of May 2024 and has to be transposed nationally by 29.5.2026. The Federal Government is now preparing to implement the requirements of the amended EU Buildings Directive. Given that key votes are still ongoing, no concrete information on the implementation of the necessary measures can be provided at this stage.

2.2.11. The benchmarks for 2030, 2040 and 2050, nationally defined measurable progress indicators, an evidence-based estimate of the expected progress; Energy savings and wider benefits and their contributions to the Union's energy efficiency targets in line with the roadmaps of the strategies for the long-term renovation of the national stock of residential and non-residential buildings, both public and private, as referred to in Article 2a of Directive 2010/31/EU

Indicative milestones regarding progress indicators from the LTRS pursuant to Article 2a(2) EPBD old version.

The indicative milestone was derived from the Long Term Renovation Strategy (LTRS) pursuant to Article 2a(2) of the EPBD (old version). Given that the contributions of individual sectors to greenhouse gas emission reductions in Germany for the years after 2030 had not yet been determined nationally at the time of drafting the LTRS, Germany has not yet quantified milestones for 2040 and beyond. The indicators and indicative milestones are to be further developed as part of the preparation of the National Building Renovation Plan (NBRP) in accordance with Article 3 of the revised Energy Performance of Buildings Directive. In order to achieve climate neutrality in the buildings sector in 2045, further milestones are to be defined for the remaining period until 2045, taking into account the trajectory already developed up to 2030. Germany has set energy performance as the first indicator in its LTRS in accordance with the EPBD in force at the time (see Figure 14). The target value shown in Table A3 is the one defined in the LTRS. In addition to the examination and further development of the indicators used in drawing up the National Renovation Plan, complementary indicators will also emerge from the continuation of the building data base in the future.

Indicative milestone according to the long-term renovation strategy (2020)

	2008 (base year)	IN 2021	IN 2022	2030
Energy performance – non-renewable	4.400	3.410	3.273	2000
Primary energy consumption (PEVn.E. in PJ)				

Total floor area to be renovated/energy savings to be achieved in accordance with Article 6 of the new EU Energy Efficiency Directive, based on the example of public buildings

An important part of the EU’s energy savings is to be achieved through energy renovations. To this end, 3 % of the total floor area of heated and/or cooled buildings each year must be publicly owned. Facilities (Federal Government, Länder, municipalities) are renovated to at least nearly zero-energy buildings (NZEB) or zero-energy buildings (ZEBs). In order to document the progress in each case, Germany, in consultation with the Länder, is developing a public building inventory. The Federal Government has until 31 December 2013 to use the alternative approach set out in Article 6 EED. Reported to the EU on December 2023. The corresponding estimated savings will be submitted later. Due to the difficult data situation, in order to accurately quantify the expected energy savings, it is necessary to draw up the building inventory through which the public institutions of the Federal Government, the Länder and the municipalities are recorded.

2.2.111. Where applicable, other national objectives, including long term targets or strategies and sectoral targets, and national objectives in areas such as energy efficiency in the transport sector and with regard to heating and cooling

Greenhouse gas neutral transport by 2045

The 2010 Energy Concept decided to reduce final energy consumption in transport by around 10 % by 2020 and by around 40 % by 2050 compared to 2005. In addition, in the 2050 Climate Change Plan, the Federal Government decided that the transport system in Germany should be almost independent of fossil carbon fuels in 2050 and thus largely net-zero greenhouse gas emissions.

Heating and cooling

In addition to the objectives set out in point 2.1.2.v., there is a target for wired heating and cooling to develop heating and cooling networks and, in the medium term, to reconnect at least 100.000 buildings to heating networks.

2.3. Dimension Energy security

2.3.1. The elements set out in point (c) of Article 4

Ensuring a secure energy supply with sufficient availability of all necessary energy sources and secure infrastructure is essential for a developed economy. This has recently highlighted the energy crisis resulting from Russia's war of aggression against Ukraine. The Federal Government's first National Security Strategy of 2023 defines resilience – including diversification – and sustainability as objectives to achieve national security. The aim of the Federal Government's energy and climate policy is therefore to ensure the supply to the public at all times in a stable manner at affordable, climate and socially acceptable conditions. The energy security assessment is typically carried out in two independent dimensions: Resource availability, transmission, distribution and tax security. As a third dimension, the existence of effective mechanisms and management capacities for crisis preparedness and management can be added. The Federal Government is taking numerous measures to strengthen security of supply in all three dimensions. This includes ensuring sufficient reserves and redundancy. These contribute to increasing resilience to supply crises and reducing the likelihood of supply crises occurring.

Accelerating the roll-out of renewable energies, together with energy savings, efficiency and the phasing out of unCO₂carbon-free fossil fuels, is the crucial step to diversify energy supply and increase energy security in the long term.

The Federal Government shall ensure that energy supplies are also ensured during the transitional period leading to climate neutrality. To this end, an energy infrastructure based on the precautionary principle, flexible and envisioned in European solidarity will be put in place. Diversification of energy supply sources and transport, as well as sufficient flexibility, safety buffers and resilience, are also essential on the transition path and allow for effective responses to imminent shortages.

A high degree of diversification and stable relations with supplier countries are at the heart of all energy security decisions. For example, planning and building its own LNG infrastructure aims to overcome one-sided dependencies and strengthen preparedness and resilience. The LNG Acceleration Act created the necessary legal conditions. Furthermore, the new infrastructure is already being planned in such a way that it can be gradually switched to hydrogen.

In order to respond adequately, quickly and flexibly to critical supply situations, sufficient safety buffers in the form of energy storages, which are protected from external interference, are also necessary. This concerns, on the one hand, the storage of traditional fossil fuels, including natural gas. For example, in order to address the potential risk of external interference on critical gas storage infrastructure, all gas storage system operators with at least one entry point to the German transmission network will have to be certified by the Federal Network Agency in the future. On the other hand, work is already ongoing on storage strategies for future energy carriers,

such as hydrogen. The aim is also to develop overarching storage strategies in the future to address existing interdependencies.

In an increasingly renewables-based energy supply, it will also be essential to be able to offset temporary volatility in the future. Long-term and stable framework conditions are needed to invest in new and hydrogen-ready gas-fired power plants. To this end, the planned Power Plant Safety Act, implementing the power plant strategy, sets the framework for a stable and decarbonised energy supply.

Energy security includes the protection of critical infrastructure in electricity, gas, mineral oil and district heating. The BSI-KRITIS Regulation, which refers to the BSI Act, defines critical services: A public service the failure or impairment of which would lead to significant shortages of supply or threats to public security. The BSI-KRITIS Regulation defines thresholds for specific asset categories above which an installation qualifies as critical infrastructure. The Energy Industry Act lays down cybersecurity requirements for electricity and gas operators. It also obliges network operators for electricity and gas to ensure secure and reliable system operation. This includes the security of the infrastructure.

Another measure to ensure the security of energy supply is to ensure that no undertakings active in the energy sector in Germany are sold to purchasers from third countries where this constitutes a threat to the public security and order of the Federal Republic of Germany. If non-EU investors want to take over a German company in whole or in part, a clearance certificate is required. As part of an investment audit procedure under the Foreign Trade Regulation, corresponding acquisitions are checked in detail. In addition, in order to address new risks and prepare adaptation strategies in a timely manner, work is ongoing to improve and expand existing monitoring measures and risk analysis. As energy sources are in some cases complex interrelationships, this will in principle take a systemic perspective to ensure security of energy supply.

Gas supply in Germany is highly secure and reliable.

The Federal Republic of Germany prepares the Gas Emergency Plan for Germany in accordance with Article 8 of Regulation (EU) 2017/1938 of the European Parliament and of the Council of 25 October 2017 concerning measures to safeguard the security of gas supply and repealing Regulation (EU) No 994/2010 and in the context of good crisis preparation. Regulation (EU) 2017/1938 strengthens the internal market in natural gas in the European Union and ensures that in the event of a supply crisis a uniform approach is taken by the EU Member States. Under the temporary Council Regulation (EU) 2022/1369 of 5 August 2024, until 31 March 2024

In 2022, through coordinated gas demand reduction measures, Germany implemented a number of voluntary demand-reduction measures in 2022, which contribute to strengthening the security of energy supply.

On 24 February 2022, when the Russian Federation started an internationally illegal war of aggression against Ukraine, a Contracting Party to the Energy Community, the conditions for assessing security of supply in Germany and the EU changed. In the course of 2022, Russia first made it more difficult to purchase natural gas by introducing payment provisions in roubles and sanctioning former Russian state-owned companies in Germany and Europe. In addition, Germany's direct supply via the Nord Stream 1 pipeline first gradually decreased; the cessation of transit via the Yamal pipeline via Poland and the reduction of the transit of Ukraine also reduced the supply of natural gas to Western and Eastern Europe. With the explosions on the two strands of the Nord Stream 1 pipeline and one of the strands of Nord Stream 2 Pipeline – never in operation – at the end of September 2022 and the end of the maintenance of the Belarus-Polish Yamal border crossing, the supply of Russian pipeline gas to Germany is not possible. The deteriorating supply conditions and the sudden cessation of Russian natural gas purchases led Germany and the EU to reorient and raise their view of security of supply of natural gas in 2022.

In Germany, the tight supply situation at political level was accompanied by the first declaration of the early warning level on 30 March 2022 and the declaration of the alert level by the BMWK on 23 June 2022 in accordance with the Gas Emergency Plan. Even before the early warning stage was declared, the global crisis team for natural gas was established, which is responsible for advising the BMWK in the course of the supply crisis and in the run-up to a deterioration in the gas supply situation. In particular, the Gas Crisis Team ensured a consultation mechanism between the actors involved in the management of the crisis and ensured the exchange of the necessary information.

In order to address the critical supply situation in 2022 and in view of the winters of 2022/23 and 2023/24 considered to be critical, the measures implemented in Germany were complemented at European level with the adoption of several gas emergency regulations by the Member States and the European Commission. These included, in essence, Council Regulation (EU) 2022/1369 of 5 August 2022 on coordinated demand-reduction measures for gas (Gas Savings Regulation), limited in time until 31 March 2024, and Council Regulation (EU) 2022/2576 of 19. December 2022 on increased solidarity through better coordination of gas purchases, reliable price benchmarks and cross-border exchanges of gas (Gas Emergency Regulation), limited until 18 December 2023 and the adaptation of Regulation (EU) 2017/1938 with regard to mandatory filling targets for natural gas storage.

Regulation (EU) 2017/1938, as a basic document from Germany and Europe, provides for a comprehensive set of instruments to strengthen the EU internal market in natural gas and to achieve an adequate level of preparedness in the event of a supply crisis. Building on this, the course of the energy and primarily natural gas crisis in 2022 demonstrated the acute ability of the German Government to take action to deal with the crisis, on the one hand, by adapting relevant crisis-mitigating German and European standards. On the other hand, cooperation between federal authorities, federal states, BNetzA and market actors such as transmission system operators and the German

market area manager gas, Trading Hub Europe GmbH (THE), significantly strengthened the resilience of the German gas supply. Dealing with this supply crisis showed very practically that the security of gas supply in the EU is a shared responsibility of the Member States, their competent authorities and gas supply companies and the European Commission, that the German gas market is to be seen only in infrastructure interconnections with EU neighbouring countries and beyond, and that a supply crisis can only be resolved together.

In order to classify the severity of a supply crisis, Regulation (EU) 2017/1938 distinguishes three crisis levels: Early warning, alert and emergency level. Early warning and alert levels provide for market-based measures for gas supply undertakings. Following the declaration of the emergency stage by the Federal Government by means of a regulation, 'non-market-based measures' can be taken as a sovereign intervention by the competent authority. In addition, Regulation (EU) 2017/1938 supplements crisis levels with obligations for companies and the responsibilities of national authorities and the European Commission. According to Article 8(2) of Regulation (EU) 2017/1938, Member States are to determine the planned crisis management and preventive measures in the context of preventive action plans and emergency plans. The BMWK is responsible for drawing up the Preventive Action Plan and Emergency Plan; BNetzA prepares the national and, where appropriate, regional risk assessment as part of a regional group.

The events and the gas supply shortage that has ultimately been averted since 2022 have clearly demonstrated the need for coordinated and coherent action at EU and national level. The outcome of the 2022/23 gas crisis has shown the overarching necessity and relevance of the measures and procedures described. Previously inconceivable events quickly jeopardised the overall system, which could ultimately be resolved by all parties involved. In preparation for a possible deterioration in the supply situation, adequate crisis forecasting and preparedness remains highly relevant.

Petroleum

Germany's oil crisis preparedness is embedded both within the European Union and supranationally within the framework of the International Energy Agency (IEA). The EU and the IEA have requirements for German oil crisis preparedness, which have been centrally transposed into national law by the Petroleum Stockholding Act (Oil BevG) and the Mineral Oil Data Act. They are the legal basis in Germany for a comprehensive stockpiling of oil and petroleum products for crisis preparedness purposes. Accordingly, oil stocks of crude oil, petrol, diesel, extra liquid fuel oil (HEL) and JET A-1 fuel are held in Germany for 90 days of net imports. The oil stockpiling association, a body governed by public law, is responsible for ensuring the proper stockpiling of oil. In the event of a supply crisis, BMWK, the Federal Office for Economic Affairs and Export Control (BAFA) and the Petroleum Stockholding Association (EBV), including the Supply Coordination Group (KGV), work in which the

The oil industry is represented, in accordance with established procedures, in order to release the stocks of the EBV in the event of a crisis.

On the basis of the EnSiG, the EnSiTrV (EnSiTrV) was also adopted as a matter of priority for rail-based transport of oil and oil products, which is particularly relevant for the transport of oil and oil products by rail, with planning priority.

Electricity

Germany has a secure electricity supply and is one of the countries with the most secure supply system in the EU. Due to Germany's geographical position in Europe, a stable electricity supply in Germany is crucial for the entire European internal market. At the same time, Germany benefits from this situation as the exchange of electricity with its electricity neighbours creates the possibility to export in excess times and to import in scarcity times.

The security of electricity supply is one of the main objectives laid down in the Energy Industry Act (EnWG). This objective is particularly important in the context of the progressive expansion of renewable energies, the increase in electricity consumption due to electrification of other sectors and the simultaneous phase-out of nuclear and coal-fired electricity generation. Germany has therefore established multi-layered processes to continuously review and maintain security of supply, allowing for an early and preventive response to an undesirable reduction in the level of security of supply. These processes include the annual review of the need for network reserve power plants, the system relevance test for power plants leaving the market and the continuous monitoring of security of supply in the electricity supply sector. (see also chapter 2.4.3.ii.).

As in the case of gas and oil, ensuring security of supply in the electricity sector is primarily a task for companies active in the electricity supply sector. The national requirements for companies are as follows:

- Under Paragraphs 1 and 2 of the EnWG, they have the task of ensuring the most secure, affordable, consumer-friendly, efficient and environmentally sound electricity supply to the general public.
- Pursuant to Paragraph 13 of the EnWG, transmission system operators are responsible for the system. To this end, they have at their disposal the network and market-related measures referred to in Section 13 of the EnWG.
- According to § 14 EnWG, electricity distribution system operators have similar measures, such as transmission system operators. In doing so, they shall support the actions of the transmission system operator or of an upstream electricity distribution system operator in whose system they are integrated by means of

their own measures.

European risk-preparedness requirements also play an important role in the electricity sector. Regulation (EU) 2019/941 of the European Parliament and of the Council of 5 June 2019 on risk-preparedness in the electricity sector and repealing Directive 2005/89/EC is decisive in this regard.

On the basis of this Regulation, Germany has adopted its 'risk-preparedness plan pursuant to Article 10 of Regulation (EU) 2019/941 of the European Parliament and of the Council of 5 June 2019 on risk-preparedness in the electricity sector and repealing Directive 2005/89/EC' (as at: 20 January 2023).

Coal

Coal will in future play no role in Germany as an energy source for electricity generation. For this reason, there is no comment on the energy source for coal in Chapter 3.3 of the measure. The last coal-fired power plant in Germany is due to be shut down by 2038 at the latest. Lignite will be phased out in North Rhine-Westphalia by 2030.

2.3.ii. National objectives with regard to increasing: the diversification of energy sources and supply from third countries for the purpose of increasing the resilience of regional and national energy systems

The Federal Government is constantly vigilant to ensure adequate diversification of the German energy supply. It continuously monitors the development of energy supply and reports on this in its monitoring reports pursuant to Section 51 of the Energy Industry Act EnWG. According to this, electricity supply in Germany is based on a relatively broad generation mix between energy carriers, which largely minimises the risk of a shortage of supply for individual energy carriers. For the German gas supply, diversification of sources of supply and transport routes is an essential pillar. The gas industry is making intensive efforts to develop gas infrastructure (pipelines and storage) and to further diversify gas supply.

Natural gas/petroleum

Germany's consumption of natural gas in 2023 was 810.4 TWh. There are relatively many import routes available to supply the German market with natural gas. The LNG Acceleration Act, adopted in May 2022 and amended in July 2023, further expanded it with the development of German LNG infrastructure. The objective is to secure supply on a sustainable basis with the swift integration of LNG into the existing gas-transmission network. The operations of the Floating Storage and Regasification Units (FSRUs) which have already taken place and are planned to start operations are intended to enable LNG to be imported to the extent necessary. From 2027 onwards, a total of three land-based terminals are planned to be put into operation successively. The Federal FSRUs at the relevant sites are then to cease operations. This should also allow sufficient LNG to be imported into Germany in the medium term.

Gas consumption in Germany has fallen to 849.8 TWh in 2022, as a result of high prices due to the crisis and measures to reduce gas consumption by 17.4 % compared to the previous year, and by 4.7 % in 2023 to 810.4 TWh. In structural terms, gas demand in Germany, and thus import demand, is likely to arise as a result of measures to:

However, increasing energy efficiency, supporting the thermal transition in buildings and decarbonising industry continue to decline. According to various long-term scenarios commissioned by the Federal Ministry of Economic Affairs and Climate Protection, gas demand could fall to 549-648 TWh as a result of the measures taken to achieve the 2030 climate targets. Thereafter, the decline would accelerate further. As a result, import demand would also decrease in the future.

Neighbouring markets can also obtain gas through different routes. This means that the risk of supply disruptions will be reduced for both the German and neighbouring markets. There are cross-border flows with all neighbouring countries and gas flows from Norway via pipelines without transit through other countries. Germany has an adequately secured oil pipeline network. The supply of oil follows market economy criteria. There is no need for further regulation by the State. The natural gas and oil industry shall ensure that the supply of natural gas and oil is sufficiently diversified and shall ensure that diversification is maintained.

Coal

Lignite is produced entirely domestically in Germany. The supply can be considered as secure. Imports of hard coal are widely diversified. The security of supply of coal is estimated to be high due to the liquid world market and the international supply structures.

Electricity

For electricity, an increase in so-called interconnectivity is foreseen depending on several indicators (see 2.4.1.i). The aim is to strengthen the internal electricity market through new interconnectors. At the same time, the interconnectors will also be mainly available to the electricity market. In this context, the Electricity Regulation 2019/943 requires Member States to have a minimum trading capacity of 70 % at the latest by the end of 2025. For more information on the development of Interconnectors, see chapter 2.4.

2.3.111 . Where applicable, national objectives with regard to reducing energy import dependency from third countries, for the purpose of increasing the resilience of regional and national energy systems

The Federal Government is continuously vigilant to ensure an adequate diversification of the German energy supply. Following Russia's war of aggression against Ukraine, the

federal government successfully ended energy dependence on Russia.

2.3.1 v. National objectives for increasing the flexibility of the national energy system, in particular through the development of indigenous energy sources, demand response and energy storage

As already explained in Chapter 2.1.2, the Federal Government is pursuing a continuous expansion of the share of renewable energy in gross final energy consumption, as well as in the electricity, heating and cooling and transport sectors. The national objectives are set out in this chapter.

The integration of renewables into the electricity market and the increasing electrification of other sectors requires demand-side and supply-side flexibility. This is discussed in more detail in section 2.4.3.ii.

Renewable and transitional low-carbon hydrogen will offer an additional supply option in the future, which can reduce the demand for fossil fuels and increase flexibility. By updating the 2023 National Hydrogen Strategy, the Federal Government doubled the target for installed renewable hydrogen production capacity in Germany from 5 to 10 GW in 2030.

Biomethane obtained from refined biogas can also contribute to this. Therefore, support for biomethane is provided through competitive tenders through the Renewable Energy Act. 600 MW of installed biomethane capacity is tendered annually. The Renewable Energy Act does not provide for a specific expansion target only for biomethane.

The potential for domestic extraction of natural gas and oil is limited. Therefore, domestic support for both energy sources today covers only a limited share of demand and does not support the objective of ensuring security of supply in the future.

Domestic production of natural gas peaked in the years around the turn of the millennium, at around 21 bcm (205 TWh) and has been steadily declining since then. In 2022, the production of pure gas was 4.8 bcm. This corresponds to 46.8 TWh or 5.5 % of consumption). Industry representatives estimated at 36.4 bcm at the end of 2022 that they are safe or likely to be extracted.

Domestic oil production amounted to 1.7 million tonnes in 2022 and has also been declining for 20 years. This still represented around 2 % of domestic oil demand. The safe or probable oil reserves in Germany were estimated at 23.8 million tonnes at the end of 2022.

2.3. v. Adaptation to climate change

The Bundestag adopted the first federal Climate Adaptation Act at the end of 2023, which entered into force in mid-2024.

The law establishes, for the first time, a strategic framework for precautionary climate adaptation at all levels of government in Germany. Cities and municipalities are particularly affected when it comes to concrete preparedness for the consequences of the climate crisis. This law therefore mandates the Länder to ensure systematic and comprehensive climate adaptation strategies in the Länder and climate adaptation approaches to the territories of municipalities and districts. At the same time, the Federal Government commits with the Act to develop and implement a precautionary climate adaptation strategy with measurable targets by September 2025 at the latest and to continue to do so every four years, taking into account current scientific evidence.

In October 2022, the Federal Government Interministerial Working Group on Adaptation to Climate Change (IMAA) launched a comprehensive process to develop measurable climate adaptation targets along the clusters (in alphabetical order) 'Health', 'Infrastructure', 'Land and land use', 'urban development, spatial planning and civil protection', 'Water', 'Economy' and in an overarching cluster. The measurable climate adaptation targets, measures/instruments and indicators are developed by the federal ministries responsible for the clusters in exchange with other relevant departments and with the support of the respective subordinate authorities.

The draft targets target priority areas of climate adaptation that can be addressed by the federal level and focus primarily on the climate impacts derived from the Climate Impact and Risk Analysis (KWRA) for Germany (2021) with a particularly urgent need for action. At the end of 2023, there was an informal broad participation of associations, the Länder, municipal umbrella associations and academia, the results of which have fed into the further development of the objectives and the overarching strategy.

Policy development continued in the first half of 2024. Following the formal participation of the Länder and associations (vs. 09/2024), the Federal Cabinet is due to take a decision at the end of 2024.

2.4. Dimension Internal energy market

2.4.1 Electricity interconnectivity

Germany's central objective is to strengthen the European single market for electricity. The larger the electricity market area and the more liquid the trade in electricity, the simpler, precise and cheaper the fluctuating supply of wind and solar electricity by flexible generators and consumers across Europe can be compensated. Such a large and liquid European market area is important to implement a European energy transition in a cost-effective and secure manner.

It is also important to address the structural challenge that in Europe the most cost-effective generation locations and demand centres for electricity consumption are often geographically disparate.

In order to be able to trade electricity between all EU Member States at any time, grid expansion is central. Only if on-balance trade is followed by genuine exchanges of electricity will Member States be able to rely on electricity from their neighbouring countries and make their national energy transition more efficient by relying not only on national resources, while ensuring security of supply. Grid expansion is therefore the backbone of the European internal electricity market by distributing traded electricity to the Member States. Germany will therefore invest substantially in national and cross-border network expansion.

Europe needs network expansion and Germany needs a lot of it. Because Germany will continue to expand renewable energy sources, making a significant contribution to the EU 2030 target. In addition, the German electricity grid not only flows electricity from north to south of Germany, but also from Germany to our neighbouring countries, because of its central geographical location. Germany faces particularly high challenges in terms of network development needs and the Federal Government is resolutely addressing them.

2.4.1.1. The level of electricity interconnectivity that the Member State aims for in 2030 in consideration of the electricity interconnection target for 2030 of at least 15 %, with a strategy with the level from 2021 onwards defined in close cooperation with affected Member States, taking into account the 2020 interconnection target of 10 % and the following indicators of the urgency of action:

- (1) Price differential in the wholesale market exceeding an indicative threshold of EUR 2/MWh between Member States, regions or bidding zones;
- (2) The nominal transmission capacity of interconnectors is less than 30 per cent of the peak load.
- (3) The nominal transmission capacity of interconnectors is less than 30 % of the installed renewable generation capacity.

Each new interconnector shall be subject to a socioeconomic and environmental cost-benefit analysis and implemented only if the potential benefits outweigh the costs

In principle, the Federal Government supports the development of further interconnections with other Member States in the interests of the functioning of the European internal market for electricity.

Due to the importance of electricity grids for European electricity exchange, Germany also supports the EU 2030 targets for grid expansion.

Two things are important in the implementation of the objectives: Firstly, through the requirements of Articles 13 and 14 of the EU Electricity Market Regulation, it is central to coordinate national and European network development. In the future, Germany will synchronise the expansion of interconnectors with the extension of the corresponding national networks. Second, the general electricity interconnection targets need the right

indicator, which takes into account differences between Member States in terms of geography and energy mix.

The general objectives for the EU electricity interconnection target shall be based on installed generation capacity (10 % by 2020, 15 % by 2030). In Germany, due to the expansion of renewable energy sources, installed generation capacity is disproportionate to the expansion of interconnectors. Against this background, the three differentiated indicators are central to decisions to develop interconnectors in accordance with Article 4(d)(1) – (3) of the Governance Regulation. By implementing the interconnections already under construction and planned by 2030, Germany aims to comply with these indicators.

2.4.2 Energy transmission infrastructure

Germany is aware of the importance of national grid expansion for the functioning of the European internal electricity market. The Federal Government is therefore planning to expand the network.

decisively. Substantial expansion and reinforcement measures of around 9.300 km of German electricity grids will be implemented by 2030. Transmission system operators expect investment needs of around EUR 52 billion by 2030. These are investments in the European single market for electricity and Europe's economic location. However, such large investment plans require sufficient time for their implementation. In parallel, the Federal Government is therefore preparing an action plan to reduce grid bottlenecks under the Electricity Market Regulation, which includes network, generation and redispatch-related measures (see Section 3.4.3.i.).

The following sections explain in detail the Federal Government's plans.

2.4.2.1. Key projects for electricity transmission and gas and hydrogen transmission infrastructure and any modernisation projects necessary to achieve the objectives and targets under the five dimensions of the Energy Union Strategy

2.4.2.11. where applicable, main infrastructure projects envisaged other than Projects of Common Interest (PCIs)

Sub-chapters 2.4.2.i. and 2.4.2.ii. are presented together.

For the development of energy transmission infrastructure for electricity and gas, the transmission system operators in accordance with Section 12b EnWG for electricity and the transmission system operators pursuant to 15a EnWG for gas shall draw up new network development plans (NEPs) on a regular basis. The electricity and gas network development plans are drawn up in a multi-stage process in which system operators and the Federal Network Agency, as the regulatory authority, are strongly involved.

Electricity transmission infrastructure

On the basis of the network development plans, the Federal Government has laid down the urgent needs for a total of almost 14.000 km of lines (see below), of which approximately 1 200 km are interconnectors. In addition, the completed NEP process has identified significant new measures. This is not least because the current NEP has for the first time changed perspectives and describes three pathways towards net-zero GHG emissions in 2045. For example, the Bundesnetzagentur has confirmed a need for expansion of around 7 300 km. On this basis, the Bundesnetzagentur has issued a recommendation for the new measures to be enshrined in law, which is now being launched.

As early as 2009, the Energieleitungsausbaugesetz (EnLAG) adopted lines with a total length of approximately 1 800 km. The Federal Needs Plan Act (BBPlG) was legally adopted on the basis of previous NEPS lines with a total length of approximately 12.000 km. The status of the BBPlG and EnLAG projects after Q3 2023 is as follows:

- Development objectives of the Federal Needs Plan Act: A total length of approximately 12.000 km; currently close to 1.200 km (around 10 per cent); 1 000 km (approx. 8 per cent). 35 of the 97 projects are marked as transnational or cross-border. Of the 97 projects under the Federal Needs Plan Act, eight are currently PCIs (Nos 1, 2, 3, 4, 5, 32, 48 and 49). Three PCI projects have already been operational (Nos 29, 30 and 33).
- Development objectives of the Energy Pipeline Expansion Act: Total length approx. 1 800 km; currently close to 600 km (around 30 % of the total length); 100 km (around 60 %) have been realised. Project No 1 under the Energy Pipeline Expansion Act was also a PCI project (in operation since 2020).

Against this background, the 2021 Coalition Agreement provides for increased efforts to develop electricity grids. A large number of regulations were adopted in 2022 and 2023 to facilitate and accelerate network deployment. In addition to changes to the legal framework, best practice exchanges between licensing authorities are also specifically promoted and the objectives of network expansion as linear, economic and rapid as possible are strengthened. Regular, transparent and realistic monitoring and control is essential for the timely implementation of all network expansion projects from the NEP. In addition to the quarterly publication by the Federal Network Agency

Monitoring has been in place since 2019 by the BMWK and has strengthened and further-developed in autumn 2022.

Gas and hydrogen transmission infrastructure

The fitting-out and conversion of the gas transmission system in accordance with Section 15a of the EnWG shall be determined by the NEP for gas. It shall be drawn up by transmission system operators in each straight calendar year. In the draft Gas Network Development Plan 2022-2032 of 31 March 2023, the network development proposal includes a total of 140 measures with an investment volume of approximately EUR

4.4 billion. A total of 82 new measures have been added compared to the gas grid development plan 2020-2030. The additional measures proposed compared to the previous network development plan are largely linked to the changed flow situation in the transmission network due to the disappearance of Russian gas volumes. Against this background, and in order to ensure long-term security, network development measures play a key role for the future removal of LNG volumes. In addition, further expansion is needed for future gas-fired power plants and for the conversion of low calorific gas to gas with high calorific value.

A fast and cost-effective deployment of hydrogen network infrastructure in Germany is an important objective of the Federal Government. The construction will take place in two stages and be embedded in the European single market: The first step is the German-wide and upgraded hydrogen core network, which currently connects well-known central hydrogen sites (consumption and production) for inter-regional transport and is to become operational by the target year 2032. As a second step, integrated network development is planned on a rolling basis for gas and hydrogen with the aim of further developing the hydrogen core network scenario and demand-based.

The legal framework for planning the first stage (core network) is contained in the Act adapting the Energy Industry Law to EU law and amending further energy legislation; the Act was adopted on 29 December 2023 entered into force. The Second Act amending the EnWG, which entered into force on 17 May 2024, established the legal basis for the integrated network development plan (NEP) for gas and hydrogen (2. Hydrogen transport network development stage) and the financing of the hydrogen core network. As part of this future rolling network development planning for gas and hydrogen, transmission system operators submitted a draft scenario framework for the network development plan on 1 July 2024, based, inter alia, on assumptions on the evolution of production, supply and consumption of gas and hydrogen. Building on this, the first integrated network development plan for gas and hydrogen shall be prepared and confirmed by the regulatory authority by 30 June 2026. As part of this recurrent planning process, there is in principle the possibility of a need- and scenario-oriented adaptation of the dimensioning of the hydrogen network, for example on the basis of updated forecasts of needs in individual regions.

2.4.3 Market integration

2.4.3.1. National objectives for other aspects of the internal energy market, such as increasing system flexibility, in particular in the context of promoting competitive electricity prices in accordance with relevant sector-specific legislation, market integration and coupling to increase the tradable capacity of existing interconnectors, smart grids, aggregation, demand response, storage, distributed generation, deployment planning mechanisms, redispatching and curtailment of generation assets, and real-time price signals, with a timetable for achieving the objectives

2.4.3.11. Where applicable, national objectives related to the non-discriminatory participation of renewable energy, demand response and storage, including via aggregation, in all energy markets including a timeframe for when the objectives are to be met

2.4.3.111. Where applicable, national objectives with regard to ensuring that consumers participate in the energy system and benefit from self-generation and new technologies, including smart meters;

Sub-chapters 2.4.3.i., 2.4.3.ii. and 2.4.3.iii. are presented together.

Climate-neutral power system platform discussed central actuators

Since the beginning of 2023, the Climate-Neutral Electricity System (PKNS) platform has been discussing the drivers for the electricity market design of a future climate-neutral electricity system with a broad stakeholder circle with around 400 participants from various stakeholder organisations in the fields of energy, consumer protection, industry and civil society, science and policy (see also Section 1.3.i). In more than 20 meetings so far, the energy policy triangle has been composed of:

Security of supply, affordability and environmental sustainability are always the compass.

In four working groups, the PKNS looks at the key themes for future electricity market design:

WP “Securing the financing of renewable energies”: Ensure necessary incentives for the sufficient build-up and operation of renewable energy installations in a climate-neutral electricity system. The PKNS has pointed out that, even for future investments in renewable energy installations, a form of securing financing at low market prices is necessary in order to secure the ambitious development path of renewable energies for a climate-neutral electricity system.

WP “Extension and integration of flexibility options”: Develop necessary

frameworks to ensure that electricity demand is increasingly driven by the supply of electricity and that barriers are on the way to it. The PKNS has identified barriers to the flexibility of demand in the network charging system and has developed a roadmap for the upscaling of dynamic tariffs in order to promote the flexibility of the electricity system.

WP “Financing of taxable capacity to cover residual loads”: Ensure investment incentives for controllable capacity to cover the remaining residual load (power plants, storage and load flexibilities) in the electricity market. Key options for ensuring the financing of controllable capacity to cover residual loads have been identified here.

WG “Local signals in the electricity markets”: Control consumption and generation with local signals to better reflect the electricity grid in the market. Among other things, the advantages and disadvantages of different options for local incentives were discussed here.

The option space for further development of the electricity market design will be further condensed in the **next step towards an ‘Optional Paper’**. The discussion in the PKNS has shown that the majority of stakeholders see a need for a rapid development of the electricity market in order to meet the requirements of a climate-neutral electricity system with high shares of renewables. However, there was a wide range of views on the concrete direction of this development. The option paper will be followed by a written consultation. Both will serve as an important basis for political decision-making.

A large, liquid market area for efficient balancing of production and consumption

There was also a clear picture among PKNS stakeholders, in line with the expert opinions, that the merit order provides price transparency and thus has a central information and coordination function. It is therefore central to efficient dispatch and is at the heart of the EU’s internal market.

The provision and financing of sufficient controllable capacity is a key challenge for electricity market design. This includes, in addition to power plants, storage and load flexibilities. The system development strategy shows that controllable capacities need to respond increasingly flexibly. This is necessary to integrate RES generation into the electricity system, to meet the increasing electricity demand of new applications and to enable the conversion of other power plants (decrease in coal-fired electricity generation, conversion to, for example, hydrogen power plants, conversion to Carbon Capture and Storage (CCS), etc.). The current market design poses challenges to the financing of taxable power plants. The PKNS has discussed different options to ensure investment incentives for controllable capacity to cover the remaining residual load in the electricity market. These are the basis for further steps.

In order to secure electricity supply in a secure and cost-effective way, while integrating increasing shares of renewable energy into the electricity system, the large market area

allows for the use of geographical balancing effects in terms of generation and consumption. The high level of liquidity in the electricity market helps to flexibly and efficiently match supply and demand, including in the case of fluctuating renewable electricity generation. It also reduces the power of large suppliers over the market outcome and enables innovative players to enter the market. Uniform wholesale prices ensure that the most cost-effective generation technologies prevail in the electricity mix, regardless of location. The facilities with the lowest input costs are used on a supra-regional basis. This reduces the variable costs of the overall system. The German electricity market, as part of the large European electricity market area, reduces overall demand for generation, demand response and storage. This also reduces the investment and maintenance costs of the overall system.

In addition to the expansion of renewable energies, the power plant strategy, with the planned power plant safety law, provides a framework for frontloading investments in modern, highly flexible and climate-friendly power plants that will be able to use hydrogen in the future and thus contribute to the decarbonisation of the power plant park. It also ensures that the supply of electricity is climate-friendly even in times of low sun and wind. To this end, the power plant strategy provides for an early expansion of a total of 10 GW of new, controlled H₂-ready power plants and controllable capacities in order to rapidly realise a no-regret quantity of power plants. In addition, 500 MW of H₂ Sprinter power plants and long-term storage facilities will be put out to tender for technology testing. In addition, security of supply will also be ensured in the future through a market, technology-neutral capacity mechanism, to be operational by 2028 at the latest.

The Federal Government is convinced that the European internal market for electricity and thus the development of electricity networks is the best way to ensure cost-effective electricity supply.

The exchange of electricity between European countries is becoming increasingly important: Cross-regional synergies between generation and consumption can be exploited to make the electricity system even more flexible. It will also allow European capacities to jointly ensure security of supply. Both reduce the total cost of electricity production in Europe as a whole.

Link the sectors

Promote sector coupling, i.e. the efficient use of renewable electricity, to further develop the industry, buildings and transport sectors;

decarbonise. Renewable electricity will play an increasing role in demand sectors through sector coupling. Buildings that increasingly act as generators in the context of high photovoltaic (roof) expansion targets and, in combination with storages, mobility and heat pump applications, influence flexibility in the electricity system.

Save renewable electricity

The BMWK presented an electricity storage strategy in December 2023. This includes the BMWK's intended activities to further support the market-driven ramp-up of electricity storage facilities. Areas of action include consideration of electricity storage facilities in the context of the Renewable Energy Act, licensing issues, grid issues, construction costs subsidies, grid connection acceleration, system stability, bidirectional charging and other topics.

In April 2024, Germany has installed stationary battery storage with a total capacity close to 13 GWh, doubling since January 2023. **Consumer participation in the digitalisation of the energy transition**

The law of 27 May 2023 relaunching the digitalisation of the energy transition (GNDEW) reactivates the smart meter rollout through a statutory roll-out roadmap with binding targets and concrete timeframes and measures to reduce red tape. In order to enable consumers to share the benefits of digitalisation, consumers will be able to request the early equipping of metering stations with a smart metering system within four months from 2025.

Gradual reduction and closure of coal-fired electricity generation

The gradual reduction and end of coal diversion will contribute to the achievement of net greenhouse gas neutrality. The key instrument for managing the use of coal is the Coal Electricity Generation Endowment Act (KVBG) of 2020. It refers to the energy use of coal and lignite for the production of electricity. By 2038 at the latest:

the last coal-fired power plant in Germany will be shut down. Other forms of use of coal are not directly addressed in this Act. Due to the rising CO₂ price in the European Emissions Trading System, the model-based analyses in Chapters 4 and 5 conclude that coal-fired electricity generation, depending on CO₂ and fuel prices, which were set as exogenous parameters in the analyses, ends on the market already before the target date specified in the KVBG (see sub-chapter 3.4.3.iii.). This includes tri-power plants in Indus. The policy objective remains ideally to phase out coal by 2030.

Lignite will be phased out in North Rhine-Westphalia by 2030.

Linking electricity markets more closely

The increased coupling of the German electricity market with neighbouring markets is a key step towards achieving the Energy Union and European market integration. The European target model of a harmonised capacity calculation methodology for day-ahead and intraday trading provides direction in its capacity allocation and congestion management guidelines.

Reduce grid bottlenecks

At EU level, the proposals of the European Parliament and the Council on the Electricity Market Regulation require Member States to reduce their internal structural bottlenecks. The electricity-Trans portdemand in the German transmission system will continue to increase and grid bottlenecks will increase at least until the completion of the large high-voltage direct current (HVDC) transmission lines. One reason for this is the progressivegeographical separation between production and consumption. A large part of the load centres are located in the south and west of Germany, while new wind turbines are mostly located in northern and eastern Germany. At the same time, power plants in southernGermany are being shut down as a result of the nuclear and coal phase-out. Germany is also a hub of international electricity trade because of its geographical location between the Scandinavian electricity markets with comparatively low prices and western and southern European countries with similarhigh electricity prices: Germany often exports market-driven products to its southern neighbours.

The EU rules on the opening of interconnectors (Article 14 Electricity Market Regulation) highlight cross-border trade in electricity and lead to increased transport needs by taking into account internal grid bottlenecks and loop flows in the allocation of capacity on cross-border interconnectors only to a very limited extent. In 2019, with the 'Bidding Zone Action Plan', the Federal Government presented a package of measures to gradually increase the minimum trading capacity available for cross-border electricity trading to 70 % over a linear trajectory by the end of 2025.

2.4.4 iv. National objectives with regard to ensuring electricity system adequacy, where applicable, as well as for the flexibility of the energy system with regard to renewable energy production, including a timeframe for when the objectives are to be met

Ensuring resource adequacy

Germany aims to strengthen the European internal electricity market and to jointly ensure security of supply in Europe. In the monitoring report on security of supply in the electricity sector, adopted by the Federal Cabinet on 1 February 2023, BNetzA considers the development of the electricity market, assuming the legally planned expansion of renewables, the electricity grid and the transformation of the power plant park necessary for decarbonisation. The report shows that the chosen scenarios do not exceed the reliability standard of 2.77 hours per year and ensure the security of electricity supply in the period 2025-2031. This requires market and network developments, such as the development of demand side flexibility and the extensive use of cross-border redispatching.

Nevertheless, markets, including the electricity market, are insufficiently prepared for events the probability of which is considered by market players to be unquantifiable or negligible. If the event happens, the potential damage to businesses and the economy

can be very high at the same time. In order to make the German and European electricity system more resilient to unpredictable developments and crises, Germany considers it essential to maintain reserves. This is particularly true in the context of the phase-out of nuclear and coal-fired electricity generation in Germany. However, reserves may also be required in the long term in a net-zero GHG-neutral electricity system.

Currently, a strategic reserve, the so-called Capacity Reserve, protects the electricity market against unpredictable events. The spare capacity includes only power plants that do not participate in the electricity market and do not distort competition and price formation.

Crisis preparedness is of great importance to Germany. The aim is to make Germany even more resilient to crises. To this end, it has proven its worth in the gas supply crisis to maintain power plant capacity outside the market and to support the electricity system if needed. The experience of the crisis has shown that the European requirements for the use of strategic reserves are too restrictive to contribute to a crisis. The Federal Government will therefore advocate at European level a consistent legal framework that also allows reserves to be maintained to address crisis situations.

Large-scale balancing of production and consumption can be much more efficient in a large, liquid European market area than in small and poorly interconnected market areas. For example, the highest residual burden in each country, which has to be covered by taxable capacity, usually does not occur at the same time. Synergies in production can also be exploited, e.g. with regard to fluctuating wind demand. This requires security of supply to be considered at European level, and not just nationally, and sufficient transport and trading capacity in the common internal market is also available in scarcity situations.

Ensuring flexibility

The integration of renewables into the electricity market and the increasing electrification of other sectors requires demand and supply-side flexibility to balance the fluctuating supply of wind and solar electricity in Europe and Germany. The Federal Government aims at a flexible electricity system consisting of well-developed electricity networks and flexible power plants and consumers. Storage should also play a role where it makes sense. The requirement for flexibility in the electricity market has become even more pressing in the light of the fact that the revision of the Renewable Energy Directive sets the EU 2030 target for the share of renewable energy in gross final energy consumption from at least 32 % to at least 42.5 % plus an indicative additional 2.5 %. This makes the expansion of renewable energies, their use in other sectors and the corresponding flexibility of the electricity market much more urgent, as the share of renewable energies in the EU is expected to rise to much more than two thirds of the European electricity mix in order to achieve the target.

Flexibility (both on the market and on the network) is therefore increasingly important.

In addition to ensuring the safe operation of the grid, many different technological, market, regulatory, etc. aspects have to be taken into account, which in turn have strong interdependencies with further developments in the electricity system (e.g. grid expansion, power plants, smart meter roll-out). In the framework of the Climate-Neutral Electricity System (PKNS) platform, the WG “Extension and integration of flexibility options” discussed how flexibility options can be used to balance the balance of the system and how to integrate it into the electricity system, and what obstacles and barriers need to be removed. For example, barriers to the flexibility of demand have been identified in the network charging system. According to the PKNS, the existing system of network charges is complex and not designed to meet the requirements of the energy transition. In particular, demand-side flexibility options and storage are subject to systematic disincentives due to the existing network tariff structure. The dynamisation of network charges was mentioned as a possible actuator. Further technical discussion in the context of the PKNS will provide additional insights into how to promote a wider use of dynamic tariffs in the electricity market and thus the flexibility of the electricity system. (on what has already been done See Chapter 3.4.3.v) for the implementation of the requirements of EU law on the supply of dynamic electricity tariffs.

2.4.3 v. Where applicable, national objectives to protect energy consumers and improve the competitiveness of the retail energy sector

In Germany, competition among suppliers in the retail sector is high. The aim is to preserve the high degree of competition in the electricity and gas retail markets. This is based on competitive pricing and market liberalisation. Where appropriate, the Federal Government systematically develops the legal framework for the protection of household customers. For example, consumer protection has been further strengthened by increasing transparency in the implementation of the EU internal electricity market.

Further details on the protection of energy consumers and the competitiveness of the retail market can be found in Part 3.4.3.iv.

2.4.4 Energy poverty

Where applicable, national energy poverty targets with a timetable for their achievement.

It is important for Germany that energy remains affordable as part of the energy transition. The Federal Government therefore aims to ensure affordability for all citizens. The focus is in particular on households at risk of overload due to high energy prices. In the context of the energy price crisis, the Federal Government is intensifying its analysis of the impact of high energy prices on households.

The increases in energy prices in 2022 and 2023 put a significant burden on households. The impact of low-income households was relatively higher (cf. Annual Economic Report, AGS, 2023). This is mainly due to the disproportionately higher prices of basic goods such as energy, which account for a higher share of low-income household expenditure. Since 2022, the Federal Government has responded with substantial support measures, thereby also providing relief to low-income households.

In 2024, the Federal Government continues to ensure that, in addition to the adjustments under the Inflationsausgleichsgesetz, the basic tax-free allowance is increased by EUR 180 to EUR 11,784 to ensure that income tax payers actually receive wage increases. In addition, in particular, the increase in child benefit from EUR 219 to EUR 250 in 2023 has strengthened the disposable income of families. At the lower end of the pay distribution, the increase in the statutory minimum wage under the Minimum Wage Increase Act to EUR 12 in October 2022 led to noticeable wage increases. According to the Federal Statistical Office, around 5.8 million jobs were affected by this increase. As a result, the share of low-paid jobs among all employees fell from 19 % to 16 % in a year. As of 1 January 2024, the minimum wage was further increased to EUR 12.41, again on the basis of a decision of the Minimum Wage Commission. The Federal Government expects that real wages will rise in 2024. A return to rising real wages is a prerequisite for preserving prosperity.

Electricity, gas and heat price brakes should cushion rising costs for both households and businesses. The price brakes effectively limited the price of electricity, gas and district heating for households from March 2023 to December 2023 for 80 % of the previous year's consumption to gross prices of 40 cents for electricity, 12 cents for gas and 9.5 cents for district heating per kilowatt-hour. In March, the relief amount was also credited retroactively for January and February. This has significantly reduced the burden on households for the whole of 2023. At the same time, energy saving incentives were maintained.

Having overcome both the acute energy price crisis and the period of very high inflation rates, the Federal Government to strengthen certain price signals as a tool for the most efficient transition to net-zero greenhouse gas emissions. By means of a series of measures, the Federal Government strengthens social security in the course of the transition, whether through education and further training, the increase in housing benefits, the first-ever support for the exchange of heating based on income, or the reduction of the EEG-surcharge for the whole population already achieved (see Chapter 5.2). The abolition of the EEG-surcharge on 1 January 2023 and the associated reduction in electricity costs are essential for the current year: While the electricity and gas price brakes expired at the end of 2023, the abolition of the EEG-surcharge in 2024 will have a stronger impact

due to again higher feed-in tariffs, thus leading to substantial relief, especially for households.

In order to help the population faster and more accurately in the future, the Federal Government is continuing its work on setting up a mechanism for direct payments to individuals. By means of the 2022 Annual Tax Act of 16 In December 2022, the government created the legal basis for authorising the collection and storing of IBAN (and, where applicable, the BIC) in the database of tax identification numbers (IdNo-database). The implementation of retention as the basis for the direct payments mechanism is ongoing. The Federal Government will decide in a timely manner on key points on the concrete administrative design of the direct payments mechanism and appoint a competent authority.

Social monitoring of climate protection is also intended to analyse the distributional effects of climate protection measures in the future already during the development of the measures and to design measures as socially as possible.

In social law, the Federal Government takes a comprehensive approach to combating poverty, which does not focus on individual elements of need, such as energy. If financial support is necessary to ensure subsistence, benefits under the minimum social security schemes are granted in accordance with the Second and Twelfth Social Code (Basic Social Security Code – SGB II and social assistance – SGB XII). This includes, inter alia, so-called “normal requirements”, which also cover, for example, the costs of the general household flow. Expenditure on heating energy is included in accommodation and heating needs to the extent of the appropriate actual expenditure. In addition, energy debt can normally also be taken over on a loan basis.

The scope of these entitlements shall be determined by the legislator, having regard to the nature of the needs and the means required for them. Electricity is included in the flat-rate standard requirements. Thus, unless the standard requirements for one year are to be recalculated, the evolution of electricity prices is included in the annual update of the standard requirements. The demand for heating energy is taken into account in the accommodation and heating needs to be granted in addition to the standard requirements (§ 22 SGB II; § 35 SGB XII). Heating energy, including heating electricity, is taken into account in the amount of actual expenditure, if this is reasonable (if expenditure is higher than average, it will be checked whether this can be justified on a case-by-case basis). Hot water costs are taken into account in the central hot water supply via heating costs. In the case of decentralised hot water supply, a flat-rate additional demand is recognised for each person in the household concerned.

The basic condition for entitlement to benefits under the minimum insurance schemes of SGB II and SGB XII is that the person concerned is in need of assistance because he or she cannot cover his or her subsistence (minimum subsistence level) by means of income and assets to be taken into account (see, for example, Section 7(1), first sentence, point 3, SGB II, Section 27(1) and (2) and Section 41(1) SGB XII). If this is the

case, services for domestic electricity (as part of the standard requirements), decentralised hot water supply and adequate heating energy are provided (see, for example, Sections 20(1), 21(7) and 22(1) SGB II).

However, priority must be given to a housing cost subsidy under the Housing Benefit Act for people on low incomes before entitlement to benefits in the minimum benefit schemes. The housing allowance serves to ensure adequate and family-friendly housing and is paid as a rent subsidy or as a burden supplement for owner-occupied dwellings (Section 1 of the Housing Benefit Act).

The housing allowance depends on the number of household members to be taken into account, the rent or burden to be taken into account and the total income (Section 4 of the Housing Benefit Act). Municipalities and districts in Germany are assigned different levels of housing benefit, which have an impact on the maximum rent or burden that can be taken into account for housing benefit (Section 12 of the Housing Benefit Act). In this way, the regional housing cost level is taken into account in the performance measurement. The housing allowance also includes a heating cost component, which is added as a flat-rate supplement to the rent or charge to be taken into account, differentiated according to the number of persons (Section 12(6) of the Housing Benefit Act). In this way, warm ancillary housing costs are subsidised in a simple administrative form.

The housing benefit increased significantly as of 1 January 2023 and the number of recipient households doubled to tripled. The amount of housing benefit has been doubled on average for existing recipient households. In addition to the heating cost component, a climate component has been introduced to facilitate housing in high-energy buildings.

The Federal Government also focuses on providing information, advice and support to citizens on energy-related issues. To this end, the Federal Government supports the energy advice of consumer centres and the energysaving check.

As part of the 'Electricity Saving Check' (SSC) project, trained, formerly long-term unemployed people advise low-income households on thermal, water and electricity savings. The advice focuses on energy-saving behaviour in the heat, water and electricity sectors, and on achieving additional savings by replacing refrigerating appliances. The project will be implemented by two partners (Deutschen Caritasverband e.V. and Bundesverband der Energie- und Klimaagenturen Deutschland e.V.). Both co-operate with sites throughout Germany (around 150) through which, among other things, household advisory visits are organised and carried out. In addition, nationwide online and telephone advice is offered. The aim is to reduce CO₂ emissions and energy costs for households and the public

To decrease hands. The current project will run until 31 March 2026.

As part of the energy consultations of consumer centres, households are given independent and neutral advice on issues such as energy efficiency, energy saving, the transition from fossil to renewable energy, energy renovation, modern heating technology and funding opportunities.

Consumers can seek advice free of charge during face-to-face interviews at consumer centres or by telephone, and online lectures are also offered. In addition, energy consultants may also, where necessary, examine the specific situation in the house or apartment in order to be able to make appropriate recommendations, e.g. on improving energy efficiency or using renewable energies. In general, a small own contribution of EUR 30 must be paid for such on-site consultations. However, low-income households also receive this free of charge, like all other energy advisory services.

2.5. Dimension Research, innovation and competitiveness

2.5.1 National objectives and funding targets for public and, where available, private research and innovation relating to the Energy Union including, where appropriate, a timeframe for when the objectives are to be met

Research, development and demonstration of innovative energy technologies are also dependent on public support for research, in addition to private sector involvement. Public research funding will support and foster cooperation from basic research to applied research, technology or innovation transfer to the market, and innovation activities by industry, research organisations and universities. As a key element of energy policy, publicly funded energy research is guided by the Federal Government's policy objectives and addresses major challenges of the energy transition. The Federal Government coordinates energy research funding through the inter-departmental coordination platform for energy research policy.

As part of the support for energy research, Germany supports technical and non-technological innovation and research for the energy transition along the entire value chain. This includes the large fields of heat and electricity, but also increasing energy efficiency, integrating renewable energy into the energy system or developing alternative industrial processes that produce less or no greenhouse gas emissions.

Research funding in the energy sector makes important contributions to the modernisation of the German and European economies and to the security of the industrial location. To this end, new trends such as digitalisation will be well taken up, technology skills in the energy sector will be maintained and developed. The activation of innovation potential in small and medium-sized and young enterprises has a particular role to play.

The aim of the Federal Government's support for energy research is to develop technology-open, diverse and sustainable solutions for the energy transformation

process.

2.5.11 Where applicable, national objectives for 2050 related to the promotion of clean energy technologies and any national objectives with long-term targets (by 2050) for the deployment of low-carbon technologies, including technologies for the decarbonisation of energy and CO₂ intensive industries and for the related transport and storage infrastructure, if any;

CO₂ emissions are a major driver of anthropogenic climate change. In Germany, CO₂ emissions are mainly generated in the context of the use of fossil fuels such as coal, oil and gas. Reducing energy-related CO₂ emissions is therefore a key objective of energy policy. Energy research addresses this objective through the development of alternative industrial processes that produce less or no greenhouse gas emissions, the integration of renewable energy.

Energy into the energy system and increasing energy efficiency.

Two complementary strategies will be pursued in the field of industrial processes. On the one hand, increasing energy efficiency through reduced energy use leads to a lasting reduction in energy-related CO₂ emissions in the industrial sector. On the other hand, technologies to close the carbon cycle are being developed for certain industrial processes where the generation of CO₂ is difficult or impossible to avoid due to the process. For example, CO₂ can be used as a starting point for basic substances in the chemical industry (transposition on polymers, basic chemicals, etc.). It can also be used to produce liquid fuels in the context of sector coupling. To close the carbon cycle, technologies are needed to capture CO₂ from waste gases or the atmosphere. This can be done biologically (plant growth) or by technical methods. Research and development of CO₂ technologies for capture, transport, storage and use of CO₂ will be stepped up in order to enable domestic companies and research organisations to take the lead in these technologies that are also relevant for export.

2.5.111 Where applicable, national objectives with regard to competitiveness

A successful energy transition must be designed in a way that preserves the industrial base. It makes an important contribution to growth and job preservation. In the energy transition, three aspects are in principle central to energy-intensive industry: Cost development (including electricity costs), security of supply and reliable framework conditions. Additional energy and emissions trading costs may lead to competitive disadvantages, especially for global companies. There is a need to ensure planning and investment certainty for companies in Germany and Europe and to maintain their international competitiveness in order to prevent the relocation of production and jobs abroad through carbon leakage.

Industry has a key role to play in tackling the economic consequences of climate change, increasing resource and energy efficiency and the use of renewable energies. Innovative energy technologies that combine climate change mitigation and industrial policy objectives are crucial for this.

Research, industry, investors and public authorities work closely together to seize the opportunities through targeted innovation processes for energy-efficient and climate-friendly solutions in all lead markets and key technologies relevant to Germany. For example, there is a need to exploit the existing potentials in sector coupling, storage and efficiency technologies, plant building, microelectronics and also basic materials industries. A research and industrial policy in this sense is expected to lead the way domestically and internationally with positive effects on competitiveness and employment.

3. POLICIES AND MEASURES

3.1. Decarbonisation dimension

3.1.1. GHG emissions and removals

The Federal Climate Protection Act, as amended on 17 July 2024, sets out overall greenhouse gas emission reduction pathways and also defines indicative sectoral pathways for energy, industry, transport, buildings, agriculture and other (waste) by 2030. The sectors are not differentiated according to ETS and non-ETS emissions. A majority of emissions relevant to the Effort Sharing Regulation (ESR) are to be located in particular in the transport, buildings, agriculture and waste sectors. Compliance with the emission reduction trajectories up to net-zero greenhouse gas emissions in 2045 is verified annually by the Federal Government in a monitoring process enshrined in the Federal Climate Protection Act alongside the trajectories. For the assessment of compliance, the cumulative total annual emissions over the period 2021-2030 are crucial. If, in the opinion of the Independent Panel of Experts, these are exceeded for two consecutive years, a follow-up is required. In order to achieve the climate objectives enshrined in the Federal Climate Protection Act in the medium to long term, the Federal Government also adopts climate change programmes.

3.1.1.1. Policies and measures to achieve the target set out in Regulation (EU) 2018/842 and referred to in point 2.1.1 of this Section, as well as policies and measures to comply with Regulation (EU) 2018/841 covering all key emission sectors and sectors suitable for increasing removals, in view of the Union's climate-neutrality objective set out in Article 2(1) of Regulation (EU) 2021/1119

Cross-cutting measures

Since 1 January 2021, the Fuel Emissions Trading Act (BEHG) has been pricing emissions from fuel and fuels that are currently not covered by the EU emissions trading scheme. The law thus plays a central role in achieving the mitigation targets under the EU Climate Change Regulation. Under the Budget Financing Act 2024, the price level in the BEHG was readjusted to the original price path, which was decided by the previous government in 2020, following the suspension of the price increase in 2023 due to high energy prices. National fuel emissions trading will be transferred to the EU fuel emissions trading system as of 2027, introduced by the amendment to the EU Emissions Trading Directive 2003/87/EC. The Energy Efficiency Act entered into force on 18 November 2023. The law establishes a cross-sectoral framework to increase energy efficiency and implements, among other things, the amended EU Energy Efficiency Directive by setting national efficiency targets, requiring companies with an energy consumption of more than 7.5 GWh to introduce an energy management system, setting obligations for prevention, use and reporting on waste heat, and establishing efficiency and thermal requirements for data centres.

Buildings sector

Key measures in the buildings sector include the Federal Ministry of Energy for Efficient Buildings, the fiscal support for energy renovation of buildings and the Building Energy Act (GEG). In particular, the obligation to use 65 % of renewable energy in new heating systems in the JIT reduces the use of fossil energy sources in heat production. The law is designed in a technology-free way; this includes, inter alia, switching to heat pumps, district heating, biomass or prospective hydrogen and hydrogen derivatives. This effect is now taken into account in the quantifications in the final NECP update.

The CO₂ pricing by the BEHG, as a key element with increasing importance (introduction of ETS II from 2027), in particular improves the competitiveness of greenhouse gas neutral heating variants vis-à-vis gas and oil boilers, in the bundle of the Instrute. The Carbon Cost Allocation Act ensures that the CO₂ price incentive also works appropriately in rented buildings and – depending on the energy quality of the building – also incentivises landlords to renovate the building in proportion to landlords and tenants.

Furthermore, the Heat Planning Act (WPG) entered into force on 1 January 2024, which, among other things, obliges the Länder to ensure that heat plans are drawn up for their entire territory within certain deadlines. Systematic and comprehensive heat planning is intended to achieve ever-increasing shares of renewable energies in the supply of heat. It also identifies areas with an increased potential for energy savings. Heat planning is also intended to provide utilities, building owners and others with guidance on their future heat supply and to increase investment security. The measures are described in more detail in the energy efficiency chapter.

Transport sector

Key measures in the transport sector include the Fuel Emissions Trading Act (BEHG) as well as the CO₂ differentiation of the HGV toll, the revision and maintenance of the EU CO₂ emission standards for new cars, vans and heavy-duty vehicles, and the increase and maintenance of the GHG quota. The Federal Government welcomes the fact that emissions trading is expected to apply to the buildings and transport sectors (ETS II) from 2027. The Federal Government will allocate significant resources in the coming years to modernise and expand the rail network. By 2027, Deutsche Bahn AG's investment needs of around EUR 45 billion are to be met, inter alia, by a share of the revenue from the newly introduced CO₂ surcharge of the HGV toll. In order to ensure that rail freight transport reaches a market share of 25 % by 2030, the pro rata promotion of track access prices in rail freight transport and the promotion of innovation under the Federal Programme for the Future of Rail Freight Transport will be continued and support for the particularly competitive constraint will continue. Significantly increased single wagon traffic. Automation and vehicle technology in freight transport. The use of local public transport became simpler and cheaper with the introduction of the new German ticket on 1 May 2023.

Waste sector

Key measures in waste management include the extension of landfill ventilation measures:

optimised gas collection and reduction of food waste.

Agriculture

Key measures in agriculture include reducing nitrogen surpluses, including reducing ammonia emissions and targeted reductions in nitrous oxide emissions, and improving nitrogen efficiency, in particular by amending fertiliser legislation, promoting low-emission slurry storage and abatement techniques, as well as research, expanding organic farming, strengthening the fermentation of farmyard manure of animal origin, combined with gas-dense storage of digestate. The Federal Government is also working to guide the development of livestock populations to the surface area and to bring them into line with the objectives of climate, water and emission protection.

In the various fields of activity, the following actions will be carried out, among others:

Reduction of excess nitrogen:

Implementation of the Fertiliser Ordinance, evaluation/further development of the substance flow balance regulation, Federal programme Nutrient management; Reduction of ammonia emissions under the National Air Pollution Control Programme, investment and support programmes for operational adaptation and TA Luft; Research on nitrous oxide emissions, interaction N₂O/NH₃, etc.;

Research in precision agriculture relating to Potential savings through more efficient fertilisation (nitrogen) e.g. in the digital experimentation fields; Strengthening the Data basis/monitoring in particular of reporting support measures, etc.

Strengthening the fermentation of farmyard manure and agricultural residues:

Encourage the retrofitting of existing biogas plants towards higher use of slurry; Promotion of gas-tight storage of digestate in existing plants; Support for research and

Development, modelling and demonstration projects for co-fermenting manure with further residues, digitalisation, efficiency improvement measures; etc.

Expansion of organic farming:

The expansion of organic land is also a climate measure – the conversion to organic farming will halve the area-based greenhouse gas emissions from crop production. In its coalition agreement, the Federal Government set itself the target of having 30 % of agricultural land under organic farming by 2030. To achieve this ambitious target, the BMEL presented in November 2023 the Bio-Strategy 2030 – the national strategy for

30 % organic farming and food by 2030. The key areas of action of the 2030 Bio-Strategy are strong organic breeding, research, advice and farm funding focused on organic farming, strengthening organic value chains, including in rural areas, the expansion of organic outdoor food (especially in mass catering), education and communication at both professional and general level settings, as well as a coherent legal framework. Strengthening research into knowledge-based eco-farming is another key lever to achieve the 30 % land target.

Reduction of greenhouse gas emissions in livestock farming

The Federal Government will realise further potential savings in animal husbandry and animal nutrition. In addition to research, the future development of animal populations will be important. A combination of appropriate measures is intended to ensure that greenhouse gas emissions and other environmental impacts are reduced in the transformation of livestock farming. These include land-fixing measures and indirect influences on livestock in Germany. The Federal Government bases its support on the fact that livestock farming on farms should be carried out in a proportion of no more than two livestock units per hectare. Land use is, for example, part of the new federal programme to support the conversion of livestock farming in the pig sector. Further actions in the area of feed

for example, support for the further development and establishment of the use of workable, electronically-supported systems for the precision feeding of farm animals with the aim of maximising nutrient and energy use of fodder used in an optimised ration are medium.

Energy efficiency in agriculture

The techniques used in agriculture and horticulture can be further improved in terms of their energy needs. The Federal programme for energy efficiency in agriculture and horticulture will be continued and further developed for this purpose and the use of renewable energy will be promoted. The measures cover investment support for individual holdings. These can be both more complex CO₂ savings investments after a prior energy advice on energy saving or production of renewable energy for on-farm use, as well as simpler individual measures to save energy and use renewable energy for small-scale stationary consumers, buildings and mobile agricultural machinery without the need for energy. The individual measures include the promotion of alternative powertrains for non-road mobile machinery.

On the demand side, the BMEL provides for the promotion of sustainable consumption in the field of nutrition. The political task is to create a better environment to make it easy for consumers to eat well, i.e. healthy and consistent. This requires an integrated food policy based on a mix of instruments. Nutritional environments are of central importance. These must be designed in such a way as to promote factors that facilitate sustainable diets. The Federal Government has developed a nutrition strategy to facilitate healthy and sustainable diets.

Land use, land-use change and forestry

On 29 March 2023, the Federal Government adopted the Natural Climate Action Programme. The aim is to protect, strengthen and restore ecosystems. The programme combines climate action with nature protection and aims to ensure that degraded ecosystems are regenerated, resilient and diverse through a wide range of measures, so that they can make a lasting contribution to climate change objectives.

The Federal Government uses the Natural Climate Action Programme and other instruments such as agri-environment-climate measures under the 2nd CAP pillar includes the following measures in the LULUCF sector:

Accelerate rewetting of bog soils: In order to speed up the measures already adopted, the Federal Government will, in the short term, take forward federal support measures for climate protection through the protection of peatlands. The Federal Government has adopted the National Moor Protection Strategy and will swiftly initiate its implementation, as part of the acceleration of planning and approval, enter into agreements with the Länder that are suitable for the protection of bogs, review the planning tools in cooperation with the Länder in order to give greater weight to bog protection in specialist planning and in planning as a whole, establish a right for the public authorities to pre-empt bog soils and create a federal funding offer coordinated with the Länder, to successfully establish alternative forms of farming, e.g. with paludicultures on rewetted, previously drainage-based bog soils, and also to re-establish unused and protected conditions. The objective is to reduce annual GHG emissions from drained peatlands by 5 Mt CO₂eq by 2030.

Biodiversity-promoting increase in forest land: Substantive preparations for this action are still ongoing. First afforestation on suitable areas, where appropriate in pilot regions, is to be implemented in accordance with biodiversity-promoting requirements. Suspension of the existing joint task for agricultural structural and coastal protection (GAK) is being examined jointly with the Länder.

Creation of species-rich and climate-resilient forests through reforestation and forest conversion: As extreme weather events become more frequent as climate change progresses and climate change changes location conditions, there is a high urgency to better adapt existing forests to climate change by accelerating the already begun forest reconversion, and to restore the already degraded land as species-rich and thus climate-resilient mixed forests. The Federal Government, together with the Länder, is continuing the existing measures of 'forest conversion' and 'reforestation' as part of the joint task 'Improvement of agricultural structures and coastal protection' (GAK). As of 2024, these two measures will receive funding from the ANK and thus the KTF. The federal budget for 2024 is up to EUR 125 million.

'Climate-adapted forest management' funding programme: Only climate-resilient forests are able to provide the other ecosystem services in addition to carbon sequestration in forests and wood on a permanent basis. With the funding programme

'Introducing climate-adapted forest management', launched in November 2022, the BMEL for the first time opened long-term support in November 2022 to finance additional climate protection and biodiversity services in the forest sector and thereby reward it. Support will be provided to private and municipal forest owners who, over 10 and 20 years respectively, undertake to comply with 11 and 12 criteria of climate-adapted forest management. The programme has already reached more than 21 % of the private and municipal forest in Germany. From 1 January 2024, the support programme for climate-adapted forest management will be financed from the BMUV's share of the Natural Climate Action Programme (ANK).

Financial incentives for additional forest climate and biodiversity services: In addition to the existing support programme for 'climate-adapted forest management', which further accelerates forest conversion towards climate-adapted forests by promoting targeted measures, it is planned to develop a complementary support instrument. This creates targeted financial incentives for achieving desirable conditions such as additional structural diversity and biodiversity in forests already closer to nature and thus also aims at partially extensive forest management. For example, the support instrument continues to contribute to stabilising and increasing the carbon pool in climate-stable, environmentally valuable forest ecosystems.

Old semi-natural beech forests protect: The measure was implemented for the federal forest on 4 March 2024 by means of the individual agreement with the Federal Agency for Real Estate Tasks. In addition, the measure for private and municipal forests is implemented in a funding guideline with the measure 'Financial incentives for additional climate protection and biodiversity services in the forest'.

ClimateWildnis: A programme to secure smaller wilderness areas in forests, bogs, floodplains, coasts, mountains, former military training sites and mining successions will be re-launched.

Support for semi-natural areas: In the interests of natural climate protection, support for carbon storage measures in the agricultural landscape with a positive impact on biodiversity, high permanence, good demonstrability, adequate additionality and low leakage effects should continue within the framework of the joint task for agricultural structure and coastal protection and, in addition, under the Natural Climate Action Programme. This concerns, inter alia, the expansion of support for the creation of wooded strips, field cops, hedges, pinks and allies, e.g. with fruit trees, especially on field margins, as well as agroforestry systems. The creation of flower strips and flowering areas, as well as the maintenance and establishment of agroforestry systems, are also included, for example, in the agri-environment-climate measures of the second. Pillar of the CAP and the first eco-schemes Pillar.

Strengthening and promoting urban trees, urban forests and forest gardens: A new investment programme is intended to promote tree planting and re-establishment of urban forests for natural climate protection and the promotion of biodiversity within the framework of federal financial constitutional possibilities.

Strengthen green green space management in municipalities: The aim of this new support programme is to support municipalities in the transition to ecological management of green areas within the framework of the federal financial constitutional possibilities.

Other measures to increase the resilience of terrestrial ecosystems: As measures to increase the resilience of terrestrial ecosystems, in particular:

- swiftly implement the national water strategy adopted by the Federal Government on 15 March 2023 and establish a 'Federal programme for climate-related measures in water management and water development';
- developing a support programme for national restoration plans in line with the European Union's nature restoration objectives;
- the legal basis for soil protection is reviewed and the federal soil protection legislation is addressed to the
Adapt the challenges of mitigation, adaptation and biodiversity conservation, taking into account the different uses;
- Reduce land take and soil sealing and make greater use of existing desealing potentials than in the past; and
- other support programmes, not enumerated in detail here, set up under the Natural Climate Action Programme for the restoration of ecosystems.

Improved GHG monitoring and reporting: The accuracy and robustness of emissions data and forecasting tools for reporting will be improved, including remote sensing systems where possible in data collection. The power to legislate in Section 3a(3) of the Federal Climate Protection Act is to be used to regulate the basis for recording and reporting greenhouse gas emissions in the LULUCF sector.

Forest Climate Fund: Since 2013, the Forest Climate Fund (WKF), funded by the Climate and Transformation Fund (CTF), has been carrying out research, development, modelling and communication activities in the thematic areas of conservation and

Enhancing forest climate protection services and adapting forests to climate change. In particular, the interface between forest-related research, development and practice (practicability and knowledge transfer) will be strengthened. The WKF was phased out as part of the budget preparation as of 2024. The appropriations will be reduced to the level of commitment appropriations already entered into in the legal framework. Projects that are still in progress will be financed at the end, but new approvals are no longer possible. The new draft WKF guidelines by the BMEL and BMUV, which was intended to further strengthen funding for research and development in the forest sector from the beginning of 2024, will no longer be published due to the lack of funding

for new authorisations.

Strengthening communication and outreach: All ongoing and new activities on climate change mitigation in the LULUCF sector, in particular on natural climate action, will be presented and promoted more widely through appropriate measures to further improve the uptake and success of the measures.

Maintenance and development of humus on arable land: Agricultural measures such as multi-rotation crop rotations, catch crops and undersowings, perennial humus-propagating crops, flowering strips and agroforestry systems can contribute to humus building and thus carbon sequestration. In the model and demonstration projects for humus building in arable farming and special crops supported by the Federal Government, these measures are widely tested throughout Germany and demonstrated to the public. The development of organic farming also contributes to carbon enrichment. Planting, for example, hedgerows, pinks and allies also contributes to the humus structure. Forest strips on agricultural land improve soil quality and reduce CO₂ and pollutant pollution.

Maintenance of permanent grassland: Grassland stores high levels of carbon. The maintenance of permanent grassland is therefore also an important climate measure, unless the soils are not rewetted. The continuation of the rules for the protection of permanent grassland in the common agricultural policy contributes to this.

Further removals of greenhouse gases

Support programme for the expansion of landfill ventilation and optimisation of the gas supply

Key measures in the area of other emissions, which focus on the vast majority of these emissions, are landfill aeration, which transforms otherwise produced methane into biogenic carbon-based carbon dioxide, thus making it neutral for greenhouse gas emissions, and optimising the gas supply.

Technology Transfer Programme Light Construction

Lightweight construction aims to reduce the weight of products, save materials and energy, and increase circularity, while maintaining or improving functionality. From design to production, to the use and recycling of materials and products, this can save resources and reduce CO₂ emissions.

The Light Construction Technology Transfer Programme has supported politically relevant and close-to-application projects with high industrial participation since 2020 and until 2027. This will support Germany's industrial location in the important theme of lightweight construction and at the same time promote environmental and climate

protection. Innovative lightweight construction technologies and materials contribute to industrial transformation and business resilience in the medium and long term in times of raw material supply shortages and rising energy prices.

3.1.1.11. Where relevant, regional cooperation in this area

European Climate Action Initiative (EUCI)

The European Climate Change Initiative (EUKI) is a BMWK funding initiative to strengthen European cooperation in the further development and implementation of ambitious climate policy. The target countries are the European Member States in Eastern and South-Eastern Europe, the Baltic and the 6 countries of the Western Balkans. Support will be given to non-investment, cross-border projects that exchange good quality

Support practices between sub-state actors, civil society, business and academia.

However, the Federal Government is also in regular exchanges with other Member States. There are well-established bilateral formats with a large number of EU Member States.

Meseberg Climate Working Group (Meseberger AG)

With the Meseberg Declaration of 19 June 2018, Germany and France agreed to set up an inter-ministerial high-level climate working group ("Climate WG"). The Climate WG supports the implementation of the Paris Climate Agreement. The Ministerial Working Group on Climate Change met in 2020 and most recently on 31 May 2021 in the framework of the Franco-German Council of Ministers. Views on the energy transition and sustainable finance instruments, as well as on economic incentives, including carbon pricing aspects, have already been discussed. The WG is composed of relevant officials from the French and German sides. Work continues subliminally. Climate is also part of the French German declaration of the Franco-German Council of Ministers of January 2023.

3.1.1.111. Without prejudice to the applicability of state aid rules, financing measures, including Union support and the use of Union funds, in this area at national level, where applicable

National Climate Action Initiative (NCI)

With the NCI, the Federal Government since 2008 (Federal Ministry of the Environment, Nature Conservation and Nuclear Safety until 2021, the Federal Ministry of Economic Affairs and Climate Action since 2021) has initiated and supported a large number of climate protection projects, thereby making an important contribution to achieving national climate objectives. Its programmes and projects cover a wide range of climate action activities: With the development of long-term strategies, support for professional

climate management and investment support, the NCI contributes to anchoring climate action on the ground. The main target groups of the NCI are:

Municipalities, business and consumers, schools and educational institutions. By the end of 2022, around 45.200 projects had been implemented, worth around EUR 1.54 billion.

Mission “100 Climate-Neutral and Smart Cities by 2030”

As part of its [mission orientation, the EU](#) launched the mission “100 [Climate-Neutral and Smart Cities by 2030](#)” and announced in April 2022 the [selected participating cities, including nine German cities. The EU supported implementation through research and innovation actions; RIA\) in Horizon Europe in 2022 and 2023. The participating cities shall develop Climate City Contracts that include an overall climate-neutrality plan in relevant sectors such as energy, buildings, waste management and transport, as well as related investment plans. The NetZeroCities Mission Platform provides technical, regulatory and financial support to cities in implementing climate neutrality; the National Contact Point in the BMWSB also monitors and supports the participating German cities \(NB: In the meantime, after the departure of Frankfurt/Main, there are only eight German cities\).](#)

Implementation of the Sustainable Finance Strategy

The purpose of the Sustainable Finance Strategy is to further develop Germany into a leading sustainable finance location, to support discussion and implementation processes at national, European and global level, and to contribute to a structured, pooled stakeholder dialogue. On 25 February 2019, the Committee of State Secretary for Sustainable Development decided to develop a Sustainable Finance Strategy of the Federal Government (in force since 5 May 2021) and to set up a Sustainable Finance Advisory Council of the Federal Government (new on 10 June 2022). Important steps have already been taken to make finance more sustainable and to increase the mobilisation of private capital, e.g. expanding green bond issuances (Bund has successfully issued green federal securities since 2020); Spending Review 2021/2022 ‘Linking Sustainable Development Goals with the Federal Budget’ and the location of the International Sustainability Standards Board in Frankfurt as the key standard setter for global sustainability reporting.

Further development of KfW as a transformative promotional bank to support the transformation of

Sectors of the economy and the financial market for a GHG-neutral future

KfW will be further developed as a promotional bank to support the transformation of economic sectors and financial markets for a net-zero greenhouse gas future. Proposals for concrete implementation will be made taking into account the Sustainable Finance Strategy, within KfW’s existing capital base and in line with KfW’s strategic target system.

Federal green securities

Since 2020, the Federal Government has been issuing federal green securities, thus supporting the development of sustainable financial markets in line with the UN 2030 Agenda. The issuance creates transparency about federal green expenditure. The preparation and follow-up of the issue of green federal securities is an interministerial measure. Tasks include the selection and evaluation of appropriate green expenditure and subsequent reporting on climate, environment and nature impacts, which must be carried out within the relevant thematic departments (e.g. for energy, transport, research, etc.). The Federal Government continues its issuance strategy in the green bond segment. With the development of a green interest rate curve in Europe, Germany will be positioned internationally as a sustainable finance location.

Digital ecosystems for a climate-friendly industry

The digitalisation of supply chains across sectors and the development of digital ecosystems enable novel Industry 4.0 applications and business models. These multilateral and trustworthy data ecosystems should enable scalable, automated and widespread application of data-based solutions to increase energy and resource saving potential, including across business borders. One of the objectives of the programme is to enable companies to transparently map and manage the CO₂ footprint along entire supply chains through appropriate data-based solutions.

It is based on the assessment for the preparation of the Federal Government's KSSP, which estimates an impact of 1.59 Mt CO₂ in 2030 for the programme, with an available budget of EUR 550 million. The further development will be maintained on a pro rata basis, in particular with respect to 2030, no fundamental extension is assumed by this instrument.

Climate and Transformation Fund (KTF)

The KTF is a key instrument for financing energy and climate protection. With this special fund, the Federal Government supports, in particular, the energy renovation of buildings, but also the climate-friendly construction of new buildings, the decarbonisation of industry and the expansion of renewable energy sources, alternative propulsion systems and the expansion of refuelling and charging infrastructure.

The KTF will also support the development of a hydrogen economy and refuelling infrastructure, as well as the promotion of semiconductor production from 2024. Semiconductor production is highly relevant to net-zero GHG technologies – and thus to a successful transformation of the German economy towards net-zero GHG emissions.

DARP

In the German Recovery and Resilience Plan (DARP), three KTF projects led by the BMWK are dedicated to decarbonising industry: the IPCEI Hydrogen as well as the

'Decarbonisation of Industry' and 'Climate Change Contracts' support programmes. They receive, among other things, European funding from the Recovery and Resilience Facility for a total amount of EUR 2.5 billion.

The objective of the measures in the climate-friendly mobility component of the DARP is to establish alternative technologies in the transport sector in a sustainable manner, make it more energy-efficient, climate-friendly and environmentally friendly, and thereby further promote the energy transition in transport.

IPCEI hydrogen

The IPCEI Hydrogen aims to promote integrated projects along the entire hydrogen value chain, from the production of green hydrogen to infrastructure, to industrial use and mobility. The IPCEI Hydrogen is jointly funded by BMWK, BMDV and the Länder. The Federal Government provides 70 % of the total funding for the IPCEI projects and the Länder 30 %.

Support programme for decarbonising industry, future federal support for industry and climate protection

With the support programme 'Decarbonisation in industry', the Federal Government has since 2021 supported energy-intensive (basic) industry (including steel, chemicals, cement) in developing and investing in innovative climate mitigation technologies to prevent process-related greenhouse gas emissions. This often means transforming entire industrial sites. In 2024, the programme is part of the federal support for industry and climate action, which opens up decarbonisation support to other industrial sectors and is even more SME-friendly.

Climate change contracts

Through the newly designed instrument of 'climate protection contracts', the Federal Government creates the economic framework for the construction and operation (CAPEX and OPEX) of modern climate-friendly production facilities for energy-intensive industries. The contracts secure industrial companies against price risks and offset additional costs between traditional and climate-friendly practices for a technological transition. The instrument thus contributes both to meeting national climate objectives and to strengthening Germany's industrial and innovation location.

3.1.2. Renewable energy

3.1.2.1. Policies and measures to achieve the national contribution to the binding 2030 Union target for renewable energy and trajectories as referred to in point (a)(2) Article 4, and, where applicable or available, the elements referred to in point 2.1.2 of this Annex, including sector- and technology-specific measures

3.1.2.2. (a) Renewable energies in general

Reform of the Renewable Energy Act (EEG 2023)

The reform of the Renewable Energy Act (EEG 2023), which entered into force on 1 January 2023, is the largest reform in decades. It includes numerous measures to accelerate the roll-out of renewable energy, with a target of at least 80 % share of renewable energy in gross electricity consumption in 2030. Of particular note is the newly introduced principle that renewable energy is in the overriding public interest and serves public security. This means that renewable energies will in future take precedence over other interests in balancing decisions, except in the interests of national and alliance defence. This will increase the speed of planning and permitting procedures.

Offshore Wind Energy Act

As of 1 January 2023, a comprehensive amendment to the Wind Energy Act (WindSeeG) entered into force. The amendment aims to contribute to the target of increasing the share of renewable energy in electricity consumption to at least 80 % by 2030. To this end, the amendment massively increases the expansion paths and tender volumes. The deployment target for offshore wind energy increases to at least 30 gigawatts (GW) by 2030. At least 40 GW of installed capacity by 2035 and 70 gigawatts of installed capacity by 2045. In particular, the amendment speeds up procurement, planning and approval procedures by pooling and streamlining audits. The applicable tender design will be redesigned. In addition, offshore expansion will be explicitly in the overriding public interest in the future and will thus be strengthened in balancing decisions with other public goods, provided that the security of national and alliance defence is not compromised.

Land development plan 2023 for offshore wind energy

In January 2023, the responsible Federal Maritime and Hydrographic Agency published the new 2023 area development plan for offshore wind energy. It secures the land to reach the 2030 target and already sets the basis for reaching the 2040 target.

Offshore Implementation Agreement 2022

In addition, in the area of offshore wind energy, the 2022 offshore realisation agreement was concluded between the participating federal states and industry stakeholders. In particular, the agreement focuses on concrete timetables for defined milestones as regards the start and end of the relevant planning and authorisation procedures, as well as the start of construction and commissioning of offshore connection lines.

Wind-an-Land Act

The Wind an Land Act has been in force since 1 February 2023. It includes the

introduction of the Wind on Land Needs Act (WindBG), legal provisions in the Building Code (BauGB) and monitoring provisions in the Renewable Energy Act (EEG 2023).

Wind-on-shore strategy

The wind-on-shore strategy is a comprehensive work programme with legal and non-statutory measures in 12 fields of action to accelerate the development of onshore wind energy and remove barriers.

2032 area targets

With the so-called Wind-on-Land Act and the Wind on Area Needs Act (WindBG) contained therein, the Federal Government for the first time set a target for the area to be designated for onshore wind energy. More specifically, the law requires a total of 2 % of the federal area to be shown by the end of 2032. It also ensures that:

WindBG, that by the end of 2027 a share of 1, 4 per cent of the federal area is available for the use of onshore wind energy. An allocation key is binding for each federal government to set individual area targets, ranging from 1.8 % to 2.2 % of the respective Land area in 2032. If the targets set by the cut-off dates are not met, wind turbines will be privileged in the outdoor area throughout the planning area. By integrating the area objectives into planning law, who simplifies and speeds up planning procedures. On the other hand, legal consequences were laid down in the event of achievement of objectives and failure to meet objectives. If the area objective is achieved, wind energy installations will only be privileged under construction law within wind power areas. If the area objective is not met, wind energy projects will, on the other hand, remain privileged throughout the external area of construction planning. Minimum social distancing rules, if any, are also deleted if the objective is not achieved.

For the purposes of monitoring, the Länder are required to demonstrate, by 31 May 2024, as part of the reporting, the start of implementation to achieve the contribution values by means of appropriate planning decisions at Land level or the entry into force of provincial laws or spatial plans setting binding (regional or municipal) sub-area targets (cf. Section 3(3) of the WindBG).

Speeding up and simplifying permitting procedures (wind onshore)

In 2021, approval procedures in the Federal Government averaged more than two years from the submission of the initial documents and more than 10 months after the completeness of the application was established. Many important measures have been launched to shorten procedures, some of which are showing some initial successes.

Among other things, the particular importance of renewable energies for the transition towards climate neutrality has been laid down in law, by including the principle that the construction and operation of renewable energy installations and their ancillary installations are in the overriding public interest and serve public security in the

Renewable Energy Act, cf. § 2 EEG 2023. This means that:

Renewable energy installations must be taken into account as a matter of priority in any consideration of protected products until electricity generation in the federal territory is almost neutral from greenhouse gas emissions, provided that no interests relating to the defence of the federal states and alliances are concerned.

The implementing rules for Article 6 of the EU Emergency Authorisation Regulation (Regulation (EU) 2022/2577) in the Wind Land Needs Act (WindBG) are significantly speeding up. The WindBG provides for temporary relief for the granting of permits for wind turbines in designated wind power areas. Under Paragraph 6 of the WindBG, for the period of 18 months in designated wind power areas, the environmental impact assessment and the assessment under species protection law do not apply. This requires that the wind energy areas have already undergone a Strategic Environmental Assessment (SEA) at planning level. In order to safeguard the interests of species protection, operators must implement appropriate and proportionate prevention and mitigation measures.

In particular, in the absence of such measures, operators must pay financial compensation to the national species support programme.

Uniform national standardisation in the area of species protection also creates significant simplifications in licensing procedures. To this end, the Federal Nature Conservation Act (BNatschG) has been amended. A key measure is that the prohibition of killing and injury under species protection law is now examined on the basis of an exhaustive list of 15 breeding bird species at risk of conflict (single breeding pairs) with specified test areas. At the same time, recognised protective measures for these species are laid down. Furthermore, the amended provisions in the BNatschG make the granting of a derogation under species protection law legally certain and substantially easier, in particular for non-hazardous species.

Further facilitations in designated wind areas and standardisation in species protection legislation are planned. This concerns the planned standardisation of habitat potential analysis (HPA) and the decided introduction of probabilistics. The latter is to be done first for the red kiln, but then gradually for other species.

In addition to the planned measures for the protection of species, many other measures are planned to improve the framework conditions for the development of onshore wind energy. Parliament is currently negotiating, for example, an amendment to the Federal Immission Control Act (BImSchG), the central law under which in Germany wind turbines are authorised onshore. The current government draft amendment contains important measures to simplify and speed up permitting procedures for onshore wind turbines and electrolyzers for green hydrogen. By way of example, with the new rules envisaged, the time limits in the approval procedure can no longer be extended indefinitely by the authority – an important reason to date for the long duration of proceedings. In future, an extension will be possible only once and thereafter only with the express consent of the applicant. In addition, the deadline for discussion in wind-on-

shore procedures will be removed, the submission of documentation for project promoters will be facilitated and (urgent) redress procedures will be made more efficient. It also strengthens the role of the project manager, a thirdparty acting as a management supporter. This already exists under current law, but in future it will also be mandatory at the request of the project promoter and its tasks will be significantly expanded (e.g. review of deadlines, evaluation of documents, management of the date of discussion, draft decision– the decision itself remains with the authority).

The planned amendment to the BImSchG also contains important improvements for the repowering of wind turbines (§ 16b BImSchG). This includes, inter alia, a delta assessment for all public interests (Paragraph 16b of the BImSchG), i.e. requirements are to be examined only in so far as repowering produces adverse effects in relation to the current state. The amendment also facilitates the repowering of old installations (paragraph 3) and further simplifies the procedure.

With the envisaged transposition of Directive (EU) 2018/2001 on the promotion of the use of energy from renewable sources (RED III) into national law, other important simplification and acceleration measures will enter into force. With a view to speeding up the development of renewable energies, RED III provides for permitting facilitations in so-called ‘acceleration areas’.

Photovoltaic strategy

The photovoltaic strategy of the Federal Ministry of Economic Affairs and Climate Protection is the result of an extensive consultation process. More than 600 opinions have been submitted by stakeholders and have fed into the final version of the strategy. On the one hand, the strategy aims to help shape the development of photovoltaics in a way that optimises the overall energy supply system. On the other hand, it identifies 11 areas of action with measures to facilitate and speed up development. Most of the measures included are to be implemented in the ‘Solar Packages I and II’.

Solar Package I

Solar Package I aims to significantly accelerate the roll-out of photovoltaics against the background of the ambitious PV roll-out targets for 2030 (215 GW, currently ~ 82 GW). The main features of the solar package include improved support for special solar installations (agri-PV, moor-PV, car park-PV, floating-PV), the introduction of community building supply and thus the creation of another model for near-production PV electricity within a building, multiple improvements and de-bureaucracies for rooftops and simplifications for balcony PV (“plug & play”).

Favouring photovoltaic systems

The aim of the Annual Tax Act 2024 is to extend the tax exemption introduced by the 2022 JStG for smaller photovoltaic installations (Section 3(72) EStG) to installations of up to 30 kW (peak) per building unit (previously 15 kW(peak)).

3.1.2.i.b) Electricity

Expansion of renewable energies to at least 80 %

Share of gross electricity consumption in 2030

The targeted, efficient, grid-synchronised and increasingly market-oriented expansion of renewable energies is a key building block for achieving the climate targets in the

Energy sector. The Federal Government has the objective of achieving a share of renewable energy in electricity consumption of at least 80 % in 2030. The share of renewables in gross electricity consumption was close to 52 % in 2023. The development of renewable energy in electricity production is strongly encouraged and steered by the Renewable Energy Act. The Renewable Energy Act sets out expansion paths for this purpose: The expansion paths for wind and solar energy were significantly increased with the last amendment 3: In the case of onshore wind power, a total of 10 gigawatts (GW) of installed capacity are expected to reach 115 GW by 2030 and 160 GW from 2040, and 22 GW per year from 2026 for solar installations, to reach a total of around 215 GW by 2030 and 400 GW by 2040. The deployment target for offshore wind energy increases to at least 30 GW by 2030, to at least 40 GW by 2035 and to at least 70 GW by 2045.

The share of renewables in gross electricity consumption, alongside expansion paths, is largely influenced by the evolution of electricity consumption (e.g. efficiency and sector coupling). As set out in the climate action programme, further measures are planned in connection with the expansion of renewable energy to at least 80 % of gross electricity consumption in 2030. These measures are fleshed out in legislative proposals.

Contracts for Difference (CfD), as provided for in the proposal for a reform of the EU electricity market, if properly designed, can reduce the investment risks for renewables and hence their cost of capital. In addition, green power-purchase Purchase Agreements (PPAs) will play a growing role in the future in order to secure investment, as well as to secure prices for renewable electricity.

In Germany, guarantees of origin pursuant to Section 79(1) EEG 2023 are issued only for non-subsidised quantities of electricity from renewable energy sources. These guarantees of origin are tradable and operators can thereby generate additional revenues.

Better synchronisation of renewable energy expansion with electricity grid expansion

The current phase of the Renewable Energy Act focuses on the grid and system integration of renewable energies. As a major EU Member State in the centre of Europe, the Federal Government's future main tasks will therefore be to develop transmission networks and to modernise and optimise existing networks. Optimisation or further development of network operation, including redispatching, can also be considered.

This is, in essence, a European challenge: Electricity generation in the most favourable locations implies the need for sufficient electricity transport to the load centres. The early roll-out of renewable energies makes this challenge particularly visible in Germany. In addition, the ever-increasing renewable electricity supply often takes place at distribution grid level. This creates additional challenges for the development and development of regional electricity grids. In order to better align the development of renewable energy in the electricity sector with the expansion of the grid, in addition to grid-related measures, direct roll-out control of renewable energies is also carried out.

Review of regional governance of renewable energy in the electricity sector

In particular, the regional management of renewable energies has an impact on the development planning and targets of the federal states, on network development planning and on the acceptance of the expansion of renewable energies and thus has a high political relevance. It thus also contributes to better synchronisation of the roll-out of electricity grids and renewable energy. The possibilities for regional governance in the development of renewables are very flexible: While for large power plants the flexibility lies in the generation itself, renewable energy generation capacity can be managed in the short and medium term in the short and medium term if grid load needs and policy conditions are identified. In addition, a regional control with a higher installed wind capacity in southern Germany would lead to a reduction of cost-intensive shutdowns due to a lower demand for electricity transport from north to south.

Energy Industry Act

This is further accelerated by the amendments to the Energy Industry Act (EnWG) in 2022 to further accelerate the construction of offshore connectivity lines, in particular through the parallel construction of several interconnection lines per year in a train path corridor.

EU Emergency Regulation Authorisation

In addition, implementing rules for Article 6 of the EU Emergency Authorisation Regulation were already transposed into national law in March 2023. This will further speed up renewable energy and electricity grid deployment processes. The scheme removes, for a limited period, the environmental impact assessment and species protection assessment in designated renewable energy and grid areas which have already undergone a Strategic Environmental Assessment (SEA). In order to preserve the protection of species, proportionate prevention and mitigation measures shall be implemented on the basis of existing data.

3.1.2.i.c) Heating and cooling

Heating and cooling in buildings

For buildings, the measures to implement the Energy Efficiency Strategy for Buildings (ESG) were set out in the long-term renovation strategy (see chapter 3.2 on energy efficiency for heating and cooling measures in the building sector). The 2022 Emergency Buildings Programme adapts this set of measures to current developments and new objectives. Many of these measures also contribute to achieving the objectives in the renewable energy dimension, in particular the Federal support for efficient buildings (BEG), the Federal support for efficient heating networks (BEW) and the climate-friendly new construction programme (CFN) and the heat pump offensive.

Of particular importance here is the amendment of the Building Energy Act (obligation for 65 % renewable energy use) in conjunction with the Heat Planning Act. The Buildings Energy Act (GEG) lays down a mandatory use of renewable energy (already applicable since 1 January 2024 to:

New buildings in new built areas; at the latest from 1 July 2026 or 1 July 2028). It also provides that from 2045 no boilers may be fuelled with fossil fuels. Transitional provisions, an application-based hardship scheme and improved conditions in the Federal Funding for Efficient Buildings (BEG) accompany the provisions of the Buildings Energy Act and help citizens and businesses to implement them.

In addition, buildings with photovoltaic installations, which receive increased support as part of the reform of the Renewable Energy Act, contribute significantly to the achievement of the national renewable energy expansion targets.

Heating networks

The Heating Planning Act sets the indicative target for the national average of 50 % of wired heat to be produced from renewable energy sources and unavoidable waste heat by 2030. In addition, the Heating Planning Act contains binding requirements for minimum shares of renewable energy or unavoidable waste heat, which require a decarbonisation pathway. By 2045, the heat networks must be fully decarbonised.

3.1.2.i.d) Transport

The update of the National Hydrogen Strategy (NWS), adopted in July 2023, creates the cross-sectoral framework for the future production of green, blue, orange and turquoise hydrogen and thus for innovation and investment. The aim of the NWS is, inter alia, to double the production capacity of green hydrogen, as well as the increased climate ambition and challenges in the energy market. The transport sector plays an important role in the update of the NWS in that, by 2030, hydrogen and its derivatives will be used not only for industrial use but also for heavy-duty vehicles and increasingly for aviation, waterborne transport and special applications such as those in the military sector. The strategy brings together short-, medium- and long-term measures to this end. Similarly, in addition to direct electrification, hydrogen and fuel cell technology and Power-to-X

(PtX) fuels will play an increasing role. The ever-increasing GHG ratio is an important tool to promote the use of green hydrogen in transport. It also provides for a triple counting of green hydrogen towards the GHG ratio in transport [37. BImSchV]. This presupposes the availability of sufficient green hydrogen, which is crucial, for example, in view of the requirements of EU law on the use of renewable gases of non-biological origin in industry, in particular green hydrogen, introduced by the last RED amendment, and which is addressed by the NWS. Incentives based on the GHG quota are not limited to national production and can also encourage imports and thus cross-border trade. Measures in the transport sector address, inter alia, the development of a basic network of hydrogen refuelling stations, the promotion of renewable fuels or the creation of the necessary framework conditions for the deployment of hydrogen in transport. A Master Plan for Hydrogen and Fuel Cell Technology in Transport will be developed to target the scaling of hydrogen and derived fuels, fuel cell vehicles, fuel cell components and systems and the required infrastructure. Taking into account and merging existing processes and strategies, funding programmes and regulatory measures, the Master Plan will define concrete steps with a timetable and address the possible contribution to the achievement of the national climate targets by 2045. With the amendment of the 10th

By decision of the Federal Cabinet of 10 April 2024, HVO 100 may be placed on the market at petrol stations.

Environmental bonus

With the environmental bonus, the Federal Government has encouraged the purchase of electric vehicles. Since 2016, a total of around EUR 10 billion has been disbursed under the environmental bonus for more than 2 million electric vehicles. As a result, electromobility in Germany was a decisive step forward. Newly registered and young used battery electric vehicles and fuel cell vehicles were recently supported.

Support was also given to vehicles with no local CO₂ emissions, regardless of their propulsion. These were assimilated to pure battery electric vehicles within the meaning of the funding guidelines. Plug-in hybrid vehicles have not benefited from the environmental bonus since 1 January 2023. Since 1 September 2023, only private individuals were eligible to apply for the environmental bonus.

By press release of 16 On December 2023, the Federal Ministry of Economic Affairs and Climate Protection announced that at the end of the 17th No new applications for the environmental bonus can be submitted to the Federal Office of Economics and Export Control (BAFA) on December 2023. This decision was based on the fact that, in the context of the negotiations on the Climate and Transformation Fund (KTF) on 13 December 2023 decided to phase out support under the environmental bonus in a timely manner. The background was that, on 15 November 2023, the Federal Constitutional Court adopted the relevant provisions in the second The 2021 supplementary budget law, thus declaring the increase of the KTF with unused loans from the coronavirus pandemic inadmissible.

3.1.2.i.e) Industry (Article 22a(1), subpara. (1))

In order to increase the share of renewable sources in the energy sources used for final energy and non-energy purposes in the industrial sector, the Federal Government relies on national and European emissions trading and a number of other national measures. These include, in particular, the support programme for climate change contracts, the programme of 'Federal Support for Energy and Resource Efficiency in the Economy' (EEW), the IPCEI Hydrogen in Industrial Production, the support programme for decarbonisation in industry (from 2024 federal support for industry and climate protection), and the creation of markets for climate-friendly commodities (green lead markets).

3.1.2.ii. Any specific regional cooperation measures and, optionally, the estimated Excess production of energy from renewable sources that could be transferred to other Member States to achieve the national contribution and trajectories referred to in point 2.1.2

Another driver of renewable energy market integration is increased regional cooperation with other Member States. The Federal Government will focus on this in the coming years.

Opening of tenders in the electricity sector

According to the approval under State aid law of the Renewable Energy Act, since 2017 the Federal Government has been required to open tenders for electricity from renewable energy sources amounting to 5 % of the capacity to be newly installed each year for installations located in other EU Member States. The aim of the opening-up is to strengthen regional cooperation, which should contribute to a common understanding of market integration and the promotion of renewable energies and to a greater convergence of national support schemes. The principle of reciprocity, a cooperation agreement with the partner country and the physical import of the subsidised electricity in the partner country are required for cross-border tenders. Cross-border tenders can be implemented through both mutually open and joint tenders with one or more partner countries. The cross-border renewable energy regulation already provides a legal basis for cross-border tenders for onshore wind and photovoltaics. Experience has also been gained in implementation: For example, a pilot co-operation with the Kingdom of Denmark was carried out in 2016 with mutually open calls for tenders for open-air photovoltaic panels. In this open call for tenders, only open-air photovoltaic installations in Denmark have been awarded a contract. The Federal Government is also actively engaged in attracting partners to further cooperation and is currently discussing in particular with Luxembourg and France. In addition, on the basis of the experience gained, the Federal Government plans to draw up a 'screen window' concept in order to ensure the transparency of cross-border tenders for:

Increase stakeholders in other Member States. The idea is to offer governments and

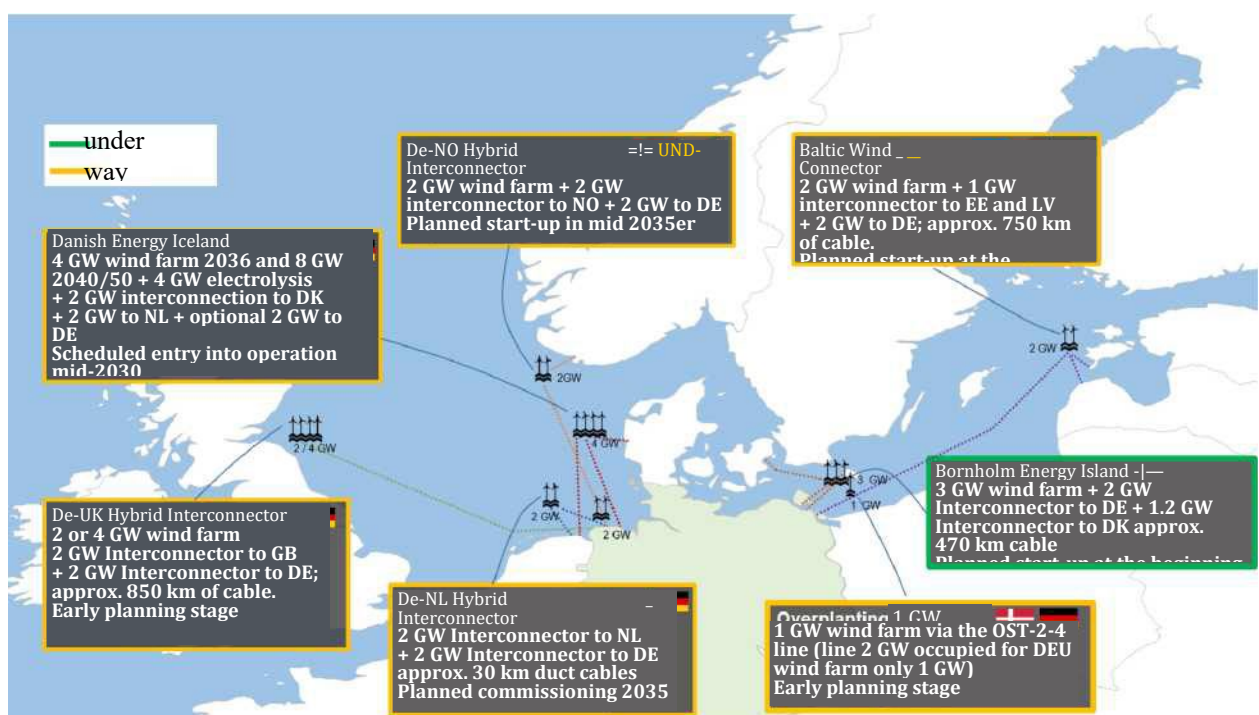
companies from other Member States to participate in cross-border tenders issued by the Federal Government and to clarify what tendering conditions would apply in the event of cooperation.

Wind-offshore cooperation

The rapid roll-out of renewable energy and cross-border infrastructure is central to Europe's energy security and resilience. Hybrid offshore projects can be an ideal combination of cross-border electricity trading and offshore wind generation.

As a future importer of green electricity and hydrogen, Germany intends to work closely with countries bordering the North Sea and the Baltic Sea to implement significant offshore wind cooperation projects. To steer this politically, Germany will host the third North Sea Summit with Heads of State and Energy Ministers in June 2025.

Below is an updated overview of Germany's offshore hybrid projects currently being planned, discussed or implemented.



Baltic Energy Market Interconnection Plan (BEMIP) – Working Group on Renewable Energy

The BEMIP Working Group on Renewable Energy provides a platform for the exchange of experience in the development of renewable energy between the Member States involved, in particular as regards the planning and promotion of the further development of renewable energy. The Group also aims to achieve a shared vision of the Baltic Sea

Develop countries bordering the EU for the development of renewable energies, in particular in the field of offshore wind energy, and identify potential cooperation projects. Further cooperation on green hydrogen among the countries bordering the Baltic Sea will also be given greater focus in order to unlock the potential of the Baltic Sea in this area. Germany actively supports the initiative and is committed to ensuring that the EU Baltic Sea countries share the relevant parts of their National Climate and Energy Plans (NECPs) in the framework of the Working Group. Synergies with North Sea

energy cooperation (see below) will be exploited. There is potential for cooperation in the Baltic Sea region, for example, in the sharing of electricity infrastructure related to the development of offshore wind energy and the development of cross-border hydrogen infrastructure.

North Sea renewable energy cooperation

This cooperation will focus on cooperation on the development of offshore wind energy, grid infrastructure and cross-border maritime spatial planning in the North Sea. As part of the initiative, the relevant Member States, including the Federal Republic of Germany, have also started to exchange with the relevant parts of the NECPs of the North Sea countries. North Sea cooperation will focus on the coordination of objectives and development strategies, including the individual timing of the call for tenders for offshore wind, as well as the exchange of experience in the development of offshore wind energy (support systems, spatial and grid planning, etc.). The purpose of the NECP cooperation is to create an aggregated development plan for offshore wind energy in the North Sea region and to create, as far as possible, a coordinated and continuous project pipeline. In addition, the relevant Member States, including the Federal Republic of Germany, are also working in the framework of North Sea energy cooperation on plans for possible joint projects for offshore wind energy use or hybrid projects where the grid connection and connection of the offshore wind turbines can be used simultaneously as an interconnector and for the discharge of the electricity produced. The Federal Government actively participates in North Sea cooperation (including through co-leading Working Group 1 on hybrid and community projects and Working Group 3 on the promotion and financing of wind energy at sea). The Federal Government sees energy cooperation in the North Sea as a major opportunity for further integration of the internal energy market and will continue to promote intensified exchange of best practices, improved coordination of energy use and grid development in the North Sea, and the preparation and design of concrete joint projects. Germany has actively participated in the joint chapter of North Sea cooperation.

Technical assistance in Greece and Cyprus

Since 2013, there has been a strategic partnership between the Federal Republic of Germany and Greece in the field of renewable energy and energy efficiency. Under the Technical Support Instrument (TSI) or the European Commission's predecessor Structural Reform Support Service (SRSS), the Federal Government finances the provision of technical assistance in Greece for the reform of the renewable and efficiency sectors (TARES, Tares+ and TARES4 projects and H2 Greece). This is provided in the form of advice from the company for international cooperation (GIZ) on the ground in Berlin and Athens. The advice will focus on supporting reform measures for the achievement of Greece's national targets by 2020 and the development of a long-term strategy for energy and climate policy for 2050, in particular with regard to the further development of renewables and energy efficiency, as well as the necessary adaptations of the Greek electricity market to increasing shares of renewables. The projects also support the exchange of experience between the Federal Republic of Germany and Greece in the preparation of the National Climate and Energy Plans

(NECPs). The technical assistance also foresees the development and implementation of concrete renewable pilot projects, for example on public buildings or on a Greek island, as well as on the implementation of the Greek National Hydrogen Strategy. The aim is to demonstrate the feasibility and cost-effectiveness of projects with high renewable shares in Greece in concrete examples.

In Cyprus, the BMWK has been supporting a TSI project to support floating photovoltaics, energy storage and offshore renewable energy since September 2023. In line with the objectives of the Cypriot NECP, the project supports the increased use of renewable energy and energy in Cyprus to reduce greenhouse gas emissions from the electricity sector and improve its security of supply.

Cross-border district heating projects

The BMWK supports the development of cross-border projects to expand and decarbonise district heating and cooling systems. For example, the Heat Alliance Kehl-Strasbourg is supported by the German-French Energy Platform. In addition, an application for funding under the Connecting Europe Facility project 'Unified Network for Innovative Transition in Energy Decarbonisation of Heating – UNITED HEAT' was supported in 2024. For the cross-border project, the district heating networks of the cities of Görlitz (DEU) and Zgorzelec (POL) will be interconnected; the Polish German Energy Platform supports the project.

Concerted Action Renewable Energy

The Concerted Action Forum on Renewable Energy (CA-RES) was set up in 2010 with the aim of enabling experts from Member States to exchange informal experiences on the implementation of the Renewable Energy Directive. Germany has taken an active role in the Forum from the outset by taking the lead of thematic sub-groups. As part of the ongoing CA-RES phase since 2021, Germany is leading the "Core Theme 1 Governance, Target Achievement and Cooperation" and is responsible for the content preparation and follow-up of the Plenary Meetings twice a year. In this role, Germany focuses on improving the co-ordination of national energy policies in the field of renewable energies. For example, on the initiative of Germany, a meeting on the target architecture and implementation of RED III between Member States took place at the Plenary Meeting in Lisbon in October 2023.

3.1.2. v. Specific measures providing for any financial support, including Union support and the use of Union funds, for the promotion of the production and use of energy from renewable sources in the electricity, heating and cooling and transport sectors

Surcharge system in the Renewable Energy Act (EEG 2023)

Citizens and the economy will be relieved of the electricity price by reducing the EEG-surcharge to zero by 1 July 2022 and completely abolished by 1 January 2023 and paying support for renewable energy from the Climate and Transformation Fund (KTF) special fund.

Investment in storage technology

In the coalition agreement on the 19th Enshrined to invest in storage technologies and smart marketing concepts in order to continue ensuring security of supply in all parts of Germany and to keep EEG and system costs as low as possible.

KfW Renewable Energy Programme

The programme shall provide long-term, low-interest financing for measures to use renewable energy for electricity generation and production of electricity and heat in combined heat and power plants, as well as measures to integrate renewable energy into the energy system. Up to 100 % of the eligible investment costs shall be financed, up to a maximum of EUR 50 million per project.

Heating networks

Since September 2022, efficient heating networks (BEW) have been financially supported by the Federal Support Programme (BEW) for the development and transformation of heating networks into net-zero greenhouse gas (GHG) heating systems. The programme supports the construction, expansion and conversion of heat networks to renewable energy and unavoidable waste heat. Connections to a heat network are also eligible under federal funding for efficient heating networks (BEW) during

Connections to smaller heating networks (so-called building networks) with up to 16 connected buildings or 100 residential units are financially supported by the Federal Support Programme for Efficient Buildings (BEG).

Buildings

The Federal Support for Efficient Buildings (BEG) supports measures to increase energy efficiency in residential and non-residential buildings and, inter alia, the replacement of old, fossil-based heating with renewable heating. Full renovations to the efficiency house standard are supported by low-interest loans from the KfW with repayment grants and individual measures, in particular on the building envelope through grants from the BAFA. The new feature since January 2024 is that the subsidies for renewable heat generators can be applied for from the KfW. There are special support incentives (bonus) for the renovation of poor energy buildings, implementation as serial renovation and heat pumps that are particularly efficient or use natural refrigerants. (see 3.2.ii)

Surcharge system for combined heat and power (CHP)

With the tools for fuel conversion from coal to gas and for strengthening the use of

renewable energy, for example in the area of heat production, the 2020 amendment to the CHP Act established the topics of decarbonisation and flexibility as essential guides for the further development of cogeneration. A key objective was to accompany the coal phase-out in Germany. The reduction in the eligible hours of full use started in 2020 with the so-called

Immediate Climate Action Programme continued in spring 2022. This continuously increases the incentive to drive CHP plants for the benefit of the electricity market. At the same time, to support the decarbonisation of heating and cooling networks connected to CHP plants, the deployment of innovative renewable heat will be encouraged. In addition, as a substantial change in 2022, the requirement to:

Hydrogen capability introduced. As a result, new CHP plants with an electrical capacity of more than 10 megawatts will have to be designed and built in such a way that they can subsequently be converted to use hydrogen at low additional costs. This avoids lock-in effects in fossil-only power plants.

Promoting the production of green hydrogen (offshore electrolysis)

In addition to offshore electricity production, offshore electrolysis is crucial for decarbonising industry. The Federal Government is pushing forward offshore electrolysis and wants to financially support green hydrogen production technologies at sea. Therefore, the Regulation on the allocation of other energy production sectors is currently being revised in order to integrate the possibility of funding.

Traffic

Under the National Innovation Programme Hydrogen and Fuel Cell Technology, the BMDV supports research and development on all transport applications, as well as the procurement of vehicles, necessary refuelling infrastructure and electrolysis facilities to produce hydrogen for mobility. The second phase of the NIP (2016-2026) increasingly focuses on scaling up hydrogen and fuel cell technologies, technological optimisation and closing remaining market gaps. More than EUR 1 billion has already been made available since 2016.

The promotion of public refuelling infrastructure is a focus of the NIP. The Climate and Transformation Fund (KTF) has its own budget title for the deployment of refuelling and recharging infrastructure. One of Germany's most developed networks in Europe, including almost 90 hydrogen refuelling stations for cars, light commercial vehicles and refuse collection vehicles, has been established in Germany, including through the promotion of the BMDV through the NIP; of these, 35 can be used at the same time for heavy trucks and buses (as of June 2024). The BMDV is now focusing its support on the deployment of a publicly accessible refuelling network for heavy fuel infrastructure compliant with Regulation (EU) 2023/1804 on the deployment of alternative fuels infrastructure (AFIR).

Commercial vehicles (lorry and buses, also usable by cars), i.e. along the TEN-T road

core network and in the 78 urban nodes of the TEN-T Regulation.

The Hyland – Hydrogen Regions in Germany programme takes a holistic approach to the regional establishment of hydrogen applications in transport as part of the NIP. For the first use cases, in addition to vehicle applications, the necessary refuelling infrastructure and, where appropriate, hydrogen production shall be included. Regions will be supported in a three-step approach to the development of integrated regional hydrogen concepts, from networking to design and implementation.

With the ‘Guidelines for the promotion of alternative propulsion in rail transport’, the BMDV supports the conversion of rail vehicles to alternative propulsions and the development of the necessary infrastructure for this purpose. Support shall be technology-open in order to provide the appropriate technology option for each context of deployment. The focus is on battery-electric and fuel cell-based trains. The Directive thus contributes to closing the gaps in the network without overhead contact lines and to achieving the climate objectives in the rail sector. The Directive ran more than 3 Calls for funding up to 31. December 2023

The BMDV supports the development of a decentralised hydrogen innovation and technology centre with the sites Duisburg, Chemnitz, Pfeffenhausen and Northern Germany (north German cluster from Bremen/Bremerhaven, Hamburg and Stade). The approvals will be sought in 2024. The BMDV provides a total initial financing of up to EUR 290 million for ITZ. Under the Hydrogen IPCEI (Important Project of Common European Interest), the BMDV has led transport-related projects, two of them in the technology wave (IPCEI Hy2Tech, approved by the EU Commission since July 2022). Four transport-related projects are part of the mobility wave (IPCEI Hy2Move, pre-notified to the EU Commission since November 2022), coordinated by the BMDV for the eight EU Member States involved. The aim is to establish a hydrogen market as far as possible through the value chain with cross-border projects between EU partners. This is also instrumental in implementing, inter alia, the National Hydrogen Strategy.

3.1.2.iv. Where applicable, the assessment of the support for electricity from renewable sources that Member States are to carry out pursuant to Article 6(4) of Directive (EU) 2018/2001

3.1.2.v. Specific measures introducing one or more contact points, streamlining administrative procedures, providing information and training, and promoting the conclusion of PPAs Summary of policies and measures within the framework that Member States are required to implement pursuant to Articles 21(6) and 22(5) of Directive (EU) 2018/2001 to promote and facilitate the development of renewable self-consumption and renewable energy communities

Single contact points

Federal Network Agency

Takes over, inter alia, notifications of electricity generation installations, grid development and the implementation of tenders in the Renewable Energy Act.

Federal Maritime and Hydrographic Agency

Responsible for land planning and preliminary investigations and permits in the field of offshore wind energy.

National organisation Hydrogen (NOW) GmbH

Established in 2008 as a programme company of the BMDV, NOW GmbH performs tasks in the field of the design, coordination and implementation of national strategies and public programmes in the field of sustainable propulsion on behalf of the Federal Government. These include, in particular, electro-mobility with fuel cells and batteries, including electricity-based fuels, as well as deployment and

Market uptake of fuel cell technology in transport and stationary sectors.

In this capacity, NOW GmbH is entrusted with, inter alia, the implementation of the National Innovation Programme Hydrogen and Fuel Cell Technology (NIP), the E-mobility funding guidelines, the charging infrastructure masterplan II and the technology-open funding programmes for the procurement of buses, commercial vehicles and rail vehicles with alternative propulsion.

Citizens' dialogue on electricity grid

The Citizens' Dialogue on Electricity Network is an open and transparent exchange between all stakeholders around the development of the electricity grid in Germany. It provides basic information and answers questions on network deployment. The Citizens' Dialogue on Electricity Network was closed as of 31.12.2023. Information and participation opportunities will continue to be ensured through the formal and informal offers of project promoters and the Federal Network Agency.

Local Heating Transition Competence Centre (CHP)

The local heat transition competence centre was opened in April 2022 and is working to prepare and make available reliable information on heat planning, practical know-how and advisory materials for the heat transition actors in Germany by means of a quality-assured knowledge base. The Centre, as an exchange platform and coordinator of a heat planning network, participates in the systematisation of experience and practical insights, as well as in the development of solutions. It provides impetus for the implementation of comprehensive heat planning as a central coordination tool for local, efficient heat supply based on renewable energies and unavoidable waste heat.

Regulatory framework for the development of renewable energy communities

Renewable energy communities have great potential for the successful roll-out of renewable energy at national and European level. In Germany, the

Regulatory frameworks for renewable energy communities: Access to renewable energy communities is open to end-consumers on a non-discriminatory basis, as is access for renewable energy communities to existing support schemes.

In addition, in order to receive EEG support, community energy companies operating onshore wind energy installations with installed capacity up to 18 megawatts and/or solar installations in the first segment with installed capacity up to and including 6 megawatts do not have to participate in EEG tenders. In addition, the investments benefit from uniform pricing: The level of remuneration for wind energy onshore is determined on the basis of the average of the highest bid still to be paid in the previous year in the previous year. For solar installations, on the other hand, the average of the highest remaining bid values in the previous year of commissioning is used.

3.1.2. iv. Check whether there is a need for the construction of new infrastructure for district heating and cooling from renewable energy sources

The transition of heating to net-zero greenhouse gas (GHG) energy must be implemented locally, taking into account local contexts. To this end, the Federal Act on Heat Planning and Decarbonisation of Heat Networks (Heat Planning Act) introduced heat planning as a key strategic tool for the heat transition. The heat maps are intended to represent the development of a greenhouse gas neutral heat supply by 2045 and to designate sub-areas suitable for e.g. wired or decentralised heat supply.

The analysis of different scenarios for achieving climate neutrality in Germany shows that a significant expansion of the heat network connections is necessary to achieve the climate objectives in the heating supply. In June 2023, in a joint statement, representatives of the heating sector expressed their support for the objective of reconnecting at least 100.000 buildings annually to heat networks in the medium term.

In addition, the successive obligation under the Buildings Energy Act to use renewable energy in the replacement of heating systems until 2028 can be fulfilled by connecting to a heating network. This should help to increase demand for thermal network connections and encourage the construction, expansion and re-densification of heat networks. In support of this, we are currently examining how the provisions of Section 556c of the BGB in conjunction with the Heat Supply Regulation can be designed for the future.

3.1.3. vii. Where applicable, specific measures on the promotion of the use of energy from biomass, especially for new biomass mobilisation taking into account: Biomass availability, including sustainable biomass: own potential and imports from third countries; other biomass uses by other sectors (agriculture and forest-based sectors); as well as measures for the sustainability of biomass production and use

Article 29(7)(b) of Directive (EU) 2023/2413 (RED III) requires Member States to provide, as part of their final updated integrated national energy and climate plan, an assessment of the domestic supply of forest biomass available for energy purposes for the period 2021 to 2030 in accordance with the criteria set out in that Article.

Forest biomass available for energy purposes is defined as forest wood directly used for energy purposes, including round and residual wood. Excluded are wood residues from the wood processing industry, wood for the production of wood pellets and wood briques, as it is mainly manufactured from residual industrial wood, wood for the production of charcoal, because in terms of volume, waste wood and wood from land outside the forest is negligible.

For 2021, as part of the 2024 felling back calculation, it was estimated that approximately 22.7 million cubic metres of domestic forest woody biomass had been used for energy purposes. 2021 was a highly catastrophic year (see the 2021 BMEL Timber Market Report), resulting in a much larger amount of wood for use than in previous years.

In addition to droughts, this is one of the reasons why estimates of the amount of energy use in the future

available forest biomass is associated with great uncertainties. The scope can only be reassessed with the results of the 2022 Federal Forest inventory available at the end of 2024 in future scenarios (or projection reports).

Prioritising the cascading use of forest woody biomass and increasing the material use of wood to substitute fossil-based raw materials should tend to reduce the woody biomass available for energy use.

The quantity of forest wood determined for 2021 is compatible with the requirements of Article 4 of Regulation (EU) 2018/841, as current policies aimed at complying with the conditions set out in Article 4 have been taken into account.

Support programme ‘Renewable raw materials’

The objective of this programme is to support research, development and demonstration projects on the energy use of growing raw materials. In addition to research and development projects, the focus is in particular on process and process optimisation with a practical demonstration and pilot character.

3.1.4. Other elements of the dimension

3.1.4.1. Where applicable, national policies and measures affecting EU ETS sectors and assessment of complementarity with and impact on the EU ETS

National transposition of EU Directive 2003/87 by the Greenhouse Gas Emissions Trading Act (TEHG)

The reform of the EU ETS at European level is currently being transposed into national law through a legislative amendment to the TEHG.

National policies and measures to achieve the objectives of the 2050 Climate Plan in the European Emissions Trading (ETS) sectors effectively reduce CO₂ across the EU.

Emissions if unused emission allowances do not lead to emissions in other Member States (so-called waterbed effect). The extent to which such a waterbed effect exists depends, inter alia, on the impact of the Market Stability Reserve (MSR) in the ETS.

Decommissioning of electricity generation capacity

In the event of closure of electricity generation capacity due to additional national measures, the second sentence of Article 12(4) of the ETS Directive gives Member States the possibility to cancel allowances from national auction volumes. With the draft law amending the Greenhouse Gas Emissions Trading Act, the Federal Government proposes that this possibility be transposed into national law in accordance with the requirements of Article 12(4) of the ETS Directive and that the decision on this be left to the discretion of the Federal Government. This discretionary decision must also take into account, in particular, the surplus reduction already brought about by the MSR, which has been operating since 2019. Cancellation requires a decision of the Federal Government. When the Federal Government decides on the cancellation of allowances, the relevant budgetary framework must be taken into account.

3.1.3.11. Policies and measures to achieve other national targets, where applicable

Climate neutral federal administration

The Federal Climate Protection Act (Bundes-Klimaschutzgesetz – KSG) gives the federal administration a special role as a model towards a net-zero greenhouse gas (GHG) Germany. Pursuant to Section 15(1) KSG, it is therefore a declared objective of the Federal Government to organise the federal administration in a climate-neutral manner by 2030. The Federal Government has already adopted measures to implement this target in the 2030 Climate Programme, the 2023 Climate Programme and the Sustainability – Further Development in 2021. The status of implementation of the measures included in the programme of measures for sustainability is recorded in an annual monitoring report.

In order to achieve climate neutrality by 2030, each authority and body of the federal administration shall do its own.

Efforts to reduce greenhouse gas emissions. In order to coordinate and support the activities and measures of the federal administration, the Climate-neutral Federal Administration (KKB) coordination body was set up. The KKB also draws up proposals for measures setting out requirements for a climate-neutral organisation of the federal administration. In addition, the KKB draws up a first climate assessment to determine the greenhouse gas emissions of the direct federal administration with data from 2022, which is then continued annually.

The climate-neutral organisation of the federal administration is to be achieved in particular by saving energy, through the efficient supply, conversion, use and storage of

energy, as well as through the efficient use of renewable energies and the choice of means of transport that are as climate-friendly as possible. Attention must be paid to the efficient use of natural resources (Section 15(2) KSG).

The measures adopted so far in the 2030 climate change programme and the sustainability – further development measures programme in 2021 concern various areas of action and include, among other things, the introduction of environmental management systems in the federal administration, failure to comply with the applicable statutory energy requirements for new construction and renovation projects of federal buildings (see Cabinet decision of 25 August 2021 on the energy efficiency definition of federal buildings, the electrification of the Federal Administration's fleets, and the reduction of emissions from missions).

Digital ecosystems for a climate-friendly industry

The digitalisation of supply chains across sectors and the development of digital ecosystems enable novel Industry 4.0 applications and business models. These multilateral and trustworthy data ecosystems are intended to enable scalable, automated and widespread application of data-based solutions, inter alia, to increase energy and resource saving potential, including across business borders. The programme aims, among other things, to enable businesses to transparently map and manage the carbon footprint along entire supply chains through appropriate data-based solutions, as well as to support a closed circular economy.

National Hydrogen Strategy (NWS)

Accelerated uptake of hydrogen: The uptake of hydrogen, its derivatives and hydrogen application technologies will be significantly accelerated and the level of ambition across the value chain will be massively increased.

Ensuring sufficient availability of hydrogen and its derivatives: The 2030 target for domestic electrolysis capacity is increased from 5 GW to at least 10 GW. The remaining needs are met by imports. The Federal Government's aim is to achieve a reliable supply of green and sustainable hydrogen to Germany. In order to ensure a rapid build-up and ramp-up of the hydrogen market and to meet the expected needs, in particular in the transformation phase, enabling the technological transition to water, at least until sufficient green hydrogen is available, other water-based paths, in particular low-carbon hydrogen from waste or natural gas associated with CCS, will also be used. A separate import strategy for hydrogen and its derivatives has been developed.

Building a high-performance hydrogen infrastructure: The creation of the necessary water transport network infrastructure is of particular importance. The Federal Government's objective is to rapidly and cost-effectively build up hydrogen transport network infrastructure in Germany, which develops further with hydrogen and is embedded in the EU internal market. The structure will take place in two stages: The first stage is the German-wide and upgraded hydrogen core network, which currently connects known central hydrogen sites (consumption and production) for inter-regional

transport and is to become operational by the target year 2032. The second step is the rolling integrated network development planning for gas and hydrogen, with the aim of further developing the hydrogen core network and implementing two-yearly scenario- and demand-based hydrogen network development planning.

expanding and expanding the meshed hydrogen transport network or adapting it to needs.

The legal framework for the planning of the first stage (core network) is contained in the Act adapting the Energy Industry Law to EU law and amending other provisions of the law on energy production; the Act was adopted on 29 December entered into force in 2023. The Second Act amending the EnWG, which entered into force on 17 May 2024, established the legal basis for the integrated network development plan (NEP) for gas and hydrogen (2. Stage of hydrogen transport network deployment) and the financing of the hydrogen core network.

On 22 July 2024, the transmission system operators (TSOs) submitted their application for the hydrogen core network to the Bundesnetzagentur (Bundesnetzagentur). By 2032, a core network connecting ports, industry, storage and power plants, which will be built gradually, is expected to be built around 9 700 km. Around 60 % will be used for existing gas pipelines and some new constructions will be needed. After examination and re-consultation by the Federal Network Agency, the Federal Network Agency is responsible for approving the core network.

It is expected that hydrogen can be used in different sectors. Hydrogen and its derivatives will be used in particular in industrial applications, in heavy-duty vehicles and increasingly in aviation and waterborne transport. In the electricity sector, hydrogen contributes to energy security of supply; gas power plants (H₂-ready) convertible to greenhouse gas neutral gases and system-relevant electrolyzers, in particular as variable and system-relevant stabilisers or flexible loads. The framework conditions in the JIT, heat planning and the European gas market package have been further developed to ensure the prospective use of hydrogen in centralised and decentralised heat generation.

Germany will become the lead provider of hydrogen technology by 2030: German suppliers are building their technological leadership and offering the entire hydrogen value chain from production (e.g. electrolyzers) to different applications (e.g. fuel cells technology).

Creating the right framework conditions: Coherent regulatory conditions at national, European and, where possible, international level support market uptake. This includes, in particular, efficient planning and licensing authorities, uniform standards and certification systems, sufficiently resourced and coordinated management at all levels.

Hydrogen import strategy: In addition, since the beginning of the parliamentary term, the Federal Government has been working hard to ensure that hydrogen can be made available alongside the ramp-up of domestic production through imports from partner

countries. To this end, the Federal Government supports and supports privately operated cross-border H₂ pipeline projects for the import of gaseous H₂ via various import corridors within Europe and neighbouring countries. They connect to the core network via border crossing points (BCPs)/interconnectors, are prioritised by the European Commission and the Member States through IPCEI (Important Project of Common European Interest) and PCI (Project of Common Interest) status and connect to non-European H₂ production and value chains. In parallel, an import strategy for hydrogen and its derivatives was developed. It shall also take into account sustainability criteria in line with the global Sustainable Development Goals. The import strategy sends a signal to partner countries that Germany wants to cooperate globally, enable reliable supply chains to Germany, establish environmental standards and be available as a technology partner to jointly contribute to decarbonisation worldwide. The Federal Government has already agreed with Norway on the long-term supply of hydrogen.

Hydrogen storage strategy

The Federal Ministry of Economic Affairs and Climate Protection is working on a hydrogen storage strategy. A green paper (discussion paper) on hydrogen storage with the industry was consulted in September 2023. The industry's initial feedback on green paper will need to be further clarified. The purpose of an expert opinion is to clarify a number of outstanding issues before the storage strategy is drawn up, with the aim of finalising the strategy this year. The content of the opinion is to (1) assess the needs of hydrogen storage facilities; and Hydrogen derivatives, (2) transformation strategy from natural gas to H₂ storage, (3) development of an operator model and financing concept for hydrogen storage; and Hydrogen derivatives and (4) support on other issues related to the development and financing of hydrogen storages and hydrogen derivatives. In parallel, legal adjustments to accelerate the roll-out of hydrogen storage in the various relevant laws are being considered.

Sector coupling

The direct use of renewable electricity can unlock efficiency potential and reduce the use of fossil fuels. Also for those applications where other GHG reduction options are difficult to implement through the direct use of electricity (e.g. in aviation, maritime and inland waterway transport or some industrial processes), electricity-based technologies based on renewable energy are an important option to achieve energy and climate objectives. Sector coupling is covered by a wide range of support measures, projects and programmes. The detailed descriptions of the measures can be found in the relevant chapters, see heating network systems in Chapter 3.1.2.iv., low-emission mobility in Chapter 3.1.3.iv., Federal support for efficient buildings in Chapter 3.2.iii., market integration in Chapter 3.4.3.i., regulatory sandboxes and SINTEG in chapter 3.5.1.

Heat Planning Act

The Federal Act on Heat Planning and Decarbonisation of Heat Networks (Heat Planning Act) introduced heat planning as a key strategic tool for the heat transition. The law

ensures that heat plans are developed across the board by 30 June 2026 in municipalities with more than 100.000 inhabitants and by 30 June 2028 in municipalities with up to 100.000 inhabitants, involving all relevant stakeholders at local level. The heat plans should set out the trend towards a net-zero greenhouse gas (GHG) heat supply by 2045, identifying sub-areas suitable for e.g. wired or decentralised heat supply. Sub-areas with high energy savings potential are also identified.

Heat planning supports building owners, energy service providers and energy utilities to make investment decisions to decarbonise heat supply. It also provides the framework for coordinated development of energy infrastructure on the ground through public participation.

The law also lays down binding targets for the ramp-up of renewable energy and unavoidable waste heat in heating networks up to full decarbonisation in 2045.

3.1.3.1 v. low-emission mobility policies and measures (including electrification of transport)

The Federal Government wants to make mobility as safe, affordable and climate-friendly as possible. The main pillars for climate-neutral mobility are the uptake of electric vehicles based on renewable electricity and the deployment of CO₂-free and CO₂-neutral fuels.

Take CO₂-neutral cars onto the road

In Germany, at least 15 million fully electric cars are to be registered by 2030. In addition to fleet regulation, additional measures are needed to significantly increase the share of electric vehicles in the sale of new vehicles and significantly reduce CO₂ emissions from car transport. These measures should significantly reduce the additional costs of electric cars compared to internal combustion engines and address the attractiveness of refuelling and recharging infrastructure from a customer perspective. In doing so, they simultaneously stimulate the supply and demand for electric drives. The Law on tax incentives for electromobility extended, inter alia, the service car scheme for the use of a battery electric vehicle or a plug-in hybrid vehicle until 2030. In addition, the private use of pure electric vehicles will not, as is currently the case, be half-way through the gross list price of EUR 70,000.

Basis of assessment, but assessed as one quarter of the tax base. In addition, under Paragraph 3d of the Motor Vehicle Tax Act, the tax exemption for first registrations was granted until 31 December 2025. The period of exemption, limited to a maximum of 10 years, shall not exceed 31. December 2030. The Federal Government has also aligned the vehicle tax more closely with CO₂ emissions. For new registrations from 1 January 2021, the tax base is based, inter alia, on the CO₂ test values per km and increased above 95 g CO₂/km in stages. The Federal Government has also advocated at European level that the CO₂ fleet limit values for new passenger cars and new light commercial vehicles can be re-registered beyond 2035 for internal combustion engines, provided that they run exclusively on CO₂ neutral fuels. This is precisely done at European

level.

Expand refuelling and charging infrastructure (passenger cars)

The deployment of comprehensive, responsive and user-friendly charging infrastructure is a prerequisite for the acceptance and increase of electromobility. The Federal Government has the objective of further developing publicly accessible recharging infrastructure, with a total of 1 million publicly accessible recharging points available in Germany by 2030.

Following the adoption of the first Master Plan on charging infrastructure in the Cabinet in 2019, the Federal Government's Masterplan charging infrastructure II followed on 19 October 2022. As an overall strategy, it sets out the objectives and measures of the Federal Government as a whole to further develop charging infrastructure. The measures focus on land availability, empowerment of municipal actors and integration of charging infrastructure and electricity grid development. For a coordinated ramp-up of public charging infrastructure at the different levels (federal/Länder/municipalities), the 'national charging infrastructure hub' was set up in 2019.

With the calls for tenders for the German network, the Federal Government is installing fast charging infrastructure at around 1000 new sites across Germany. The BMDV is responsible for awarding the

"Regionalless" for 900 rural and urban locations. Autobahn GmbH is awarding the "motorwayless" for 200 sites at uncultivated rest areas along the motorways.

As a further measure, the Federal Government decided in May 2024 to impose a fuel station supply requirement in the Cabinet. The aim is to equip a significant share of public refuelling stations with fast charging infrastructure in order to accelerate the roll-out of recharging infrastructure across the board and increase trust in electro-mobility.

Support is a central pillar in supporting recharging infrastructure roll-out. With the funding guidelines

- 'Charging infrastructure for residential buildings' (published on 24 November 2020);
- 'On-site charging infrastructure' (published on 24 March 2021)
- 'Publicly accessible charging infrastructure for electric vehicles' (published on 21 July 2021);
- Charging infrastructure for electric vehicles – businesses and municipalities (published on 17 November 2021);
- 'Solar electricity for electric vehicles' (published on 4. September 2023)

and the call for funding for the construction of commercial fast charging infrastructure for cars and trucks based on the funding guidelines on electromobility (published on 18 September 2023) covers a wide range of use cases.

The promotion of public refuelling infrastructure is a focus of the NIP. One of the most developed networks in Germany, with almost 90 hydrogen refuelling stations for cars and vans in particular, has been established in Germany, including support for the BMDV through the NIP. Its printing level is 700 bar in line with the requirements of the EU Alternative Fuels Infrastructure Regulation (AFIR), 35 of which are usable at the same time with an additional 350 bar for trucks and buses (as of June 2024). The BMDV is now focusing on the development of a publicly accessible network of refuelling stations for heavy-duty vehicles (lorry and buses) and, depending on the availability of budgetary resources, examines how further support can be provided. The focus will be on the expansion of a

Deployment of Alternative Fuels Infrastructure (AFIR) compliant basic network at publicly accessible hydrogen refuelling points for heavy-duty vehicles (lorry and buses), at the same time usable by light commercial vehicles and cars.

With the exception of support for non-publicly accessible fast charging infrastructure for SMEs and large enterprises, no funding offer is currently open for submission of applications on 18 June 2024.

Take low-carbon trucks to the road (“commercial vehicles”)

The Federal Government is supporting the expansion of the necessary recharging and hydrogen infrastructure. The target is for about a third of the mileage recorded in road freight transport to be covered by electric trucks by 2030. Since 1. A CO₂ surcharge will be applied to the HGV toll on December 2023. Zero-emission vehicles shall be up to 31. December 2025 exempts from the obligation to pay tolls and will benefit from significantly reduced toll sub-rates from 2026. Zero-emission vehicles with a technically permissible maximum laden mass not exceeding 4.25 tonnes are permanently exempted from tolls, in line with the Eurovignette Directive. At European level, a strong regulatory instrument has already been in place since 2019 with the CO₂ fleet regulation for commercial vehicles. With the revision of the Regulation on CO₂ fleet limits for new heavy-duty vehicles, the electrification of the fleet becomes more important as a climate-neutral propulsion option in the commercial vehicle sector. With the entry into force of the Regulation at the beginning of June 2024, the CO₂ reduction target was increased to 45 % for 2030 compared to 2019, and new targets for 2035 of 65 % and for 2040 of 90 % CO₂ reductions for newly registered heavy-duty vehicles were introduced. The ramp-up of climate-friendly vehicles is accompanied by accompanying measures, in particular the roll-out of charging and

Accompany hydrogen refuelling infrastructure. Further measures are taking into account the current additional costs of commercial vehicles with alternative propulsion. The development of ready-to-market hydrogen fuel cell commercial vehicles will continue to be supported, for example, under the National Innovation Programme Hydrogen and Fuel Cell Technology (NIP) for all segments, so that vehicles with this technology are offered by the mid-2020s at the latest.

Upgrade refuelling and charging infrastructure (commercial vehicles)

The deployment of refuelling and charging infrastructure for alternative propulsion must be based on transport and logistics. A systemic approach from the use of renewable energy to customer aspects for zero-emission logistics needs to be taken into account. In 2024, the tender for an initial charging network along the federal trunk roads will be published. According to the National Hydrogen Strategy, which was renewed in 2023, a master plan for hydrogen and fuel cell technology in transport is also to be drawn up, inter alia in order to target the scaling up of the necessary infrastructure. In the implementation of the EU Alternative Fuels Infrastructure Regulation (AFIR), the National Strategic Framework for Hydrogen Refuelling also outlines the indicative deployment targets for 2027 and the achievement of the EU targets by 2030, while for trucks the targets for 2025, 2027 and 2030 are to be achieved.

Support for climate-friendly retrofitting of ground-stream facilities at airports

Aircraft also need electricity on the ground while they are maintained, loaded and refueled. This electricity often comes from auxiliary turbines in the aircraft or is produced at distant parking spaces using diesel generators. Direct electricity, batteries or hydrogen can provide more efficient, zero-emission and significantly quieter power to aircraft than before. At EU level, the AFIR (Alternative Fuel Infrastructure Regulation), published in the Official Journal of the European Union on 22 September 2023, requires Member States to ensure that, at all airports of the TEN-T core and comprehensive networks, the supply of electricity to stationary aircraft at all aircraft forward positions used for commercial air transport for the purpose of boarding or disembarking passengers or for loading or unloading goods, until 31. December 2029. In order to support airports in this task, the Federal Government has put in place a support programme with investment grants for the procurement of mobile and stationary equipment by the end of 2026.

environmentally friendly ground-based power installations for the supply of aircraft, as well as the recharging/refuelling infrastructure needed for operation.

Increase in the proportion of electric motor vehicles in the fleet of the Federal Administration

The requirements of the Clean Vehicle Procurement Act (Clean Vehicle Procurement Act), which entered into force in 2021, and the Administrative Regulation on Clean Vehicle Vehicles (AVV Cleaner Vehicles) apply to the procurement of vehicles in the federal administration. The Saub Fahrzeug BeschG and the AVV Saubere Fahrzeug for the first time set minimum public procurement targets for the procurement of low- and zero-emission vehicles, which must also be explicitly complied with by the federal administration.

Enable transport to automate, connect, liquefied, innovative forms of mobility

Digitalisation can significantly improve existing transport routines, such as traffic flow and parking management, through automation, connectivity and artificial intelligence.

Digitalisation can also create new opportunities: for example, digital services with user-friendly app-based operating concepts enable simplified sharing offers for both cars, bicycles, e-scooters and e-scooters and allow for the integration of public transport services. It also allows for the pooling of journeys and the choice of a vehicle size suitable for an individual journey. The Federal Government will continue and intensify practical testing of automation, networking and the use of artificial intelligence for mobility on digital test fields and demonstrations, and will support the transition to normal operation. Experimentation clauses will also improve the conditions for doing so. The aim of the Federal Government's Gigabit Strategy is to ensure a comprehensive energy and resource-efficient supply of fibre optic fibre to home and to the latest mobile phone standard, wherever people live, work and travel, including in rural areas. With regard to emerging applications scenarios

digital mobility should also be seen as an integral part of digital networks for the gigabit society. In addition, digital working models (e.g. increased use of home and videoconferencing) help to avoid journeys.

Tax promotion of electromobility (Law on further tax promotion of electromobility and amending other tax provisions)

Official car taxation – Extension of the current special scheme for electric vehicles:

If an official car is also used for private purposes, this advantage is in principle taxed at 1 % of the domestic list price (so-called list pricing method). In 2018, this benchmark was halved for electric and off-vehicle charging hybrid electric vehicles. In order to create a long-term, legally secure planning framework for the market uptake of electromobility, this special scheme was extended until 31 December 15 December 2030 (Paragraph 6(1)(4), second sentence, points 3 and 4, and third sentence, points 3 and 4, of the EStG). In order to ensure that the environmental policy objectives of the Federal Government with a longer-term impact are adequately taken into account, the technical requirements of the special scheme have been increased in two stages: From 1 January 2022 to 31. December 2024 shall have a minimum range of 60 km (with the exclusive use of the electric propulsion engine). From 1 January 2025 to 31. December 2030 shall have a minimum range of 80 km (with the exclusive use of the electric propulsion engine). The maximum CO₂ emissions of 50 g/km remain unchanged for the whole period. For the use of vehicles which do not have CO₂ emissions/km and whose gross list price does not exceed EUR 70,000, only a quarter of the tax base shall be taken into account.

Trade tax relief for the rental and leasing of electric vehicles:

Under the first sentence of Paragraph 8(1)(d) of the GewStG, rental and leasing expenses relating to the undertaking's movable assets are to be added to profits from commercial operations for business purposes. The result is 5 % of the expenditure. By way of derogation, rental and leasing expenses for electric vehicles and off-vehicle charging hybrid electric vehicles that meet certain pollutant emissions or range criteria and for leased bicycles other than motor vehicles are added to only 2.5 %, provided that

they are based on contracts concluded after the 31st December 2019 (second sentence of Paragraph 8(1)(d) of the GewStG). The measure is limited to 2030.

Extension of the tax exemption for charging current and the flat-rate taxation for the transfer of ownership of a charging device:

Advantages granted by the employer for the electric charging of an electric or hybrid electric vehicle in the operation of the employer or an associated undertaking and for the corporate charging device temporarily made available for private use are exempt from tax under Paragraph 3(46) of the EStG. The exemption was granted until 31. December 2020. The employer may also charge wage tax at a flat rate of 25 % for the above-mentioned benefits in kind (Paragraph 40(2), first sentence, point 6, of the EStG). The flat-rate taxation was also up to 31. December 2020. In order to further promote electro-mobility, both measures were implemented until 31 December. December 2030.

Exempt job ticket and introduction of flat-rate taxation for job tickets:

Under Paragraph 3(15) of the EStG, in addition to the remuneration already due, employer benefits in addition to the employee's expenses for public transport journeys by regular service between the home and the first place of activity are exempt from tax from 2019 onwards (e.g. a job ticket). The services received exempt from tax are to be counted against the flat-rate distance allowance; the deduction of advertising costs is reduced accordingly. The scheme is open-ended. The introduction of a new flat-rate taxation option of 25 %, while at the same time refraining from reducing the distance allowance for employees deductible as advertising costs, is intended to increase the acceptance of 'job tickets' for such workers who do not have public transport at all or only very

limited use (second to fourth sentences of Paragraph 40(2) EStG). They shall also apply to the remuneration referred to in Paragraph 3(15) of the EStG which is not:

in addition to the pay already due (but by means of a salary conversion) and therefore do not fulfil the conditions for tax exemption. The scheme is open-ended.

Extension of the exemption for the supply of a business bicycle or electric bicycle to the worker:

If the employer provides the employee with a service bicycle free of charge or at a reduced price, the benefit in cash from private use is exempt from tax from 2019 (Paragraph 3(37) of the EStG). This is conditional upon the hiring-out of bicycles in addition to the pay already due. The aim is to reward that the employer provides a genuine additional benefit and does not reduce the employee's gross salary in return. The tax-exempt benefit in kind is not to be counted against the distance flat rate; the deduction of advertising costs remains. Until then, until 31 December, The temporary measure was adopted until 31 December 2021. December 2030.

Extension of the exemption for private use of a business bicycle or electric bicycle:

If the owner uses a business bicycle for private purposes, this is not taken into account when calculating profits (§ 6(1)(4) sentence 6 EStG). The advantage does not have to be taxed. Until then, until 31 December, The temporary measure was adopted until 31 December 2021. December 2030.

Industrial manufacturing for mobile and stationary energy storage (“battery cell manufacturing”)

The demand for mobile and stationary energy storage is growing at a rapid pace internationally. The Federal Government’s aim is to unlock the great value added potential of this key technology, including in Germany and Europe. To this end, since 2020, the BMWK has been supporting the development of efficient battery cell manufacturing in Germany through two IPCEIs (Important Projects of Common European Interest). These two IPCEIs will receive around EUR 1.5 billion by 2030 under KTF title 893 04 “Industrial manufacturing for mobile and stationary energy storage” by 2030.

National policy framework on the deployment of alternative fuels infrastructure (NSR)

The policy framework includes recharging infrastructure for electric vehicles, infrastructure for the supply of natural gas (compressed and liquefied natural gas) and hydrogen supply infrastructure for fuel cell vehicles. In the implementation of Directive 2014/94/EU, the NSRF sets targets for publicly accessible refuelling and recharging infrastructure and underpins them with appropriate measures. A new NSRF is under preparation to implement Regulation (EU) 2023/1804, which repealed Directive 2014/94/EU in April 2024.

National Innovation Programme for Hydrogen and Fuel Cell Technology (NIP 2)

Under the National Innovation Programme Hydrogen and Fuel Cell Technology, the BMDV supports research and development on all transport applications, as well as the procurement of vehicles, necessary refuelling infrastructure and electrolysis facilities to produce hydrogen for mobility. The second phase of the NIP (2016-2026) increasingly focuses on scaling up hydrogen and fuel cell technologies, technological optimisation and closing remaining market gaps. More than EUR 1 billion has already been made available since 2016.

The Hyland – Hydrogen Regions in Germany programme takes a holistic approach to the regional establishment of hydrogen applications in transport as part of the NIP. For the first use cases, in addition to vehicle applications, the necessary refuelling infrastructure and, where appropriate, hydrogen production shall be included. Regions will be supported in a three-step approach to the development of integrated regional hydrogen concepts, from networking to design and implementation.

Promotion of alternative powertrains in rail transport

With the ‘Guidelines for the promotion of alternative propulsion in rail transport’, the

BMDV supports the conversion of rail vehicles to alternative propulsions and the development of the necessary infrastructure for this purpose. The Directive ran more than 3

Calls for funding up to 31. December 2023. The support was designed to be technology-open to provide the appropriate technology option for each context of deployment. The focus was on battery electric and fuel cell-based trains. The Directive contributes to closing the gaps in the network without overhead contact lines and to achieving the climate objectives in the rail sector.

Promotion of alternative powertrains for buses in local public transport (DL Bus)

Until 2023, the Federal Government supported numerous projects for the technological development or procurement of electric, hybrid and biogas-fuelled buses under the relevant funding guidelines of the BMWK (formerly BMU) and the BMDV. Since 2021, the BMDV has been supporting the market uptake of alternative powertrains for buses through a stand-alone, technology-open directive. It is currently valid until 2025. BMWK Bus RL (2018-2021/22, approx. EUR 500 million, completed); RL Bus of the BMDV (2021 to 2025, approx. EUR 1 300 million, ongoing).

Development of electricity-based fuels

The fuel cell is also expected to contribute to the mobility of the future, especially for trucks and other heavy vehicles. In the longer term, Power-to-X (PtX) fuels will also play an increasing role in some transport sectors. The Federal Government will create framework conditions for the development and wholesale scaling of electrolysis and refinery processes for the production of electricity-based greenhouse gas neutral gases and fuels. This enables the use of climate-friendly basic fuels and fuels, in particular in industry, chemicals, air, heavy loads and waterborne transport, as well as for special applications such as those in the military sector. It will also launch an industrial policy initiative of the European Union to build an efficient e-fuel supply. In view of the medium-term sub-quotas for renewable fuels of non-biogenic origin for aviation and waterborne transport, the need to accompany these efforts in the implementation of RED III for transport needs to be assessed accordingly.

Support for advanced biofuels

The use of biofuels in the fuel mix reduces the fossil content of the fuel and hence the level of CO₂ pricing of the fuel. The development of liquid and gaseous renewable fuels from biomass and their large-scale production in biogas and synthesis plants will be supported in order to be able to use them in the medium and long term in certain segments of the transport sector. There is no additional support for first generation biofuels based on food and feed crops. Bioenergy production will in future be based more on waste and residues. It is therefore important to effectively cover all waste and residues. There is no reason to expect an increase in the area under bioenergy and is not possible due to area restrictions. The sustainability criteria of RED II also apply to imports (from the internal market and from third countries). In addition, as part of the

national implementation of RED III, the existing sub-quota for continuing biofuels is updated, taking into account environmental and economic aspects and technical feasibility. Advanced biofuels are already on the market and already contribute to GHG reduction in the transport sector. Existing research and development gaps in innovative repeatable biofuels (e.g. straw fuels) will be filled through projects and demonstration projects in order to achieve large-scale production in the medium term.

Promoting natural gas mobility

Natural gas as a fuel will continue to benefit from tax incentives until 2026. By using biomethane gas and in the future regenerative synthetic methane, natural gas vehicles can contribute to CO₂ savings.

Strengthening rail passenger transport

This package of measures focuses on CO₂ reduction through modal shift to rail, which needs to be significantly strengthened to this end. Decarbonisation can be further enhanced through the electrification of more railways and the use of alternative (hydrogen, battery) propulsion systems.

The Federal Government and Deutsche Bahn will invest in rail infrastructure by 2030, with a historic increase in funding, in order to improve the performance of the rail network. The introduction of digital control and safety technology on central axes and the digitalisation of interlockings will also significantly increase capacity. Congestion corridors on the rail network will be developed in a targeted manner. These measures form the basis for the gradual implementation of the German tact. In addition, the electrified network will be expanded and compacted.

The development and deployment of further technologies for digitalised rail operations will also lead to efficiency gains in the rail system. Similarly, capacity increases in the existing infrastructure can be achieved by driving trains at a shorter distance without losing safety.

This additional capacity increase imposes high requirements on planning and construction capacity, also in view of the simultaneous need for replacement investment measures. The financing will be implemented through the Performance and Financing Agreement, which will apply from 2020 for a duration of 10 years. Consideration will be given to how increased planning and investment certainty can also be made possible by increasing capacity and introducing digital control and backup technologies and the digitalisation of interlockings. The Federal Government will provide significant additional federal funds to strengthen rail by 2030. In addition, additional capital increases in Deutsche Bahn AG are planned to be made available to Deutsche Bahn AG between 2024 and 2029 for the upgrading and modernisation of the railway infrastructure. This will enable society to invest additional capital in the modernisation, expansion and electrification of the rail network and the railway system.

Flights were sometimes cheaper than rail travel to the same destination before the

coronavirus pandemic. From the point of view of climate protection, this is a wrong incentive effect. Therefore, VAT on long-distance rail tickets was reduced from 19 % to the reduced VAT rate of 7 % on 1 January 2020.

General rehabilitation of the high-performance corridors on the rail network

The Federal Government and DB InfraGO AG are specifically undertaking a general rehabilitation of selected high-performance corridors in order to strengthen rail, improve the quality and reliability of rail traffic and achieve the modal shift targets in the long term. During the general refurbishment of the high-performance corridors, highly frequented and loaded routes will be completely closed and completely rehabilitated for a short bundled intervention. In this connection, the Federal Government urges that bypass routes be upgraded in advance for the general refurbishment period in order to be able to ensure that these routes operate as smoothly and as stable as possible during general refurbishment. Following a major refurbishment, these lines are also available for passenger and freight transport in a better condition.

Establishment of the railway infrastructure company under the company DB InfraGO AG

Rail plays a key role in ensuring safe, affordable and climate-friendly mobility. For this reason, the Federal Government has implemented the biggest reform of the railway sector in Germany since the railway reform 30 years ago. A public-interest infrastructure company for rail was set up as a central transport policy measure adopted by this Federal Government. DB Station & Service AG was merged into DB Netz AG and its name changed to DB InfraGO AG on 27 December 2023. It is true that DB InfraGO AG continues to:

Business, but it becomes an undertaking which must be guided by objectives of general interest, in particular transport and climate change policy, on an equal footing. In this way, projects and infrastructure investments can be more closely aligned with the Federal Government's objectives and strategies.

Making local public transport more attractive

The aim of this package of measures is to strengthen local public transport. This is the responsibility of the Länder and municipalities. Public passenger transport, in particular in the rail sector, is associated with significantly lower GHG emissions per passenger-kilometre than private motorised transport (MIV) due to the high degree of electrification and the high energy efficiency of electrical systems. This field of action therefore focuses on reducing CO₂ through the modal shift from MIV to local public transport and through the transformation of LPT into alternative drives. The use of these drives in buses and local rail passenger transport has a direct climate effect compared to traditional technologies and also contributes to the reduction of air

pollutants and noise from electric propulsion. In addition, decarbonisation can also be further pursued in public passenger transport, for example through the use of alternative propulsion in buses and local rail passenger transport.

In order to make LPT more attractive, a variety of measures are needed, which vary from region to region: the development and extension of the network for S-, U- and trams, the improvement of the quality of supply and reliability, the establishment of more frequent connections, and the improvement of comfort and safety. Last but not least, there is a need for a consistent digitalisation of local public transport and a stronger user and demand orientation.

In recent years, the Federal Government has on several occasions increased regionalisation funds to implement the Federal Government's climate change package, to help the sector cope with the financial disadvantages caused by the coronavirus outbreak and to compensate for cost increases. In 2024, the 'regular' regionalisation funds already amount to around EUR 11.2 billion. In addition, EUR 1.5 billion for the German ticket launched on 1 May 2023.

With the increase of federal funds under the Municipal Transport Financing Act (GVFG) for the expansion of local public transport to EUR 1 billion per year from 2021 onwards, the Federal Government:

Create conditions for improving the attractiveness of local public transport. The rail-based local transport network can thus be developed. The modalities of the GVFG have been further aligned with the objectives of climate-friendliness of local public transport. In order for additional scaling-up measures to be specifically planned and implemented already in the coming years, the funds will be increased to EUR 2 billion per year from 2025 onwards and will be dynamised by 1.8 % from 2026.

The modernisation and electrification of bus fleets will be further promoted by existing support for electric and hydrogen powered buses and buses powered by biogas. By 2030, up to 50 % of urban buses should be electric. The Federal Government also supports local transport through the support programme 'Model projects to strengthen local public transport', which was launched in early 2021. Currently, 19 model projects from two calls for funding are being supported with a total of around EUR 320 million.

Development of cycle paths and bicycle parking options and improvement of framework conditions

The Federal Government will increase the attractiveness of cycling by further improving road conditions and road safety. The National Radical Transport Plan 3.0 (NRVP 3.0) – the Cycling Strategy for Germany until 2030 – made cycling strategically also in the context of climate change mitigation. Objective: More, better and safer cycling in cities and rural areas in Germany (including doubling the number of kilometres driven by cycling by 2030). In various programmes, the Federal Government provides comprehensive funding for investment and non-investment funding for cycling under the responsibility of the Länder and municipalities, including programmes to promote:

- everyday cycling infrastructure (special urban and rural programme)
- long-distance tourist cycle paths (German cycling network)
- of lighthouse projects (investive pilot projects)
- bike parks at railway stations
- research and communication (non-investment model projects implementing the NRVP)
- on equipping heavy-duty vehicles with turning assistance systems
- the upgrading of structures at intersections between railway lines and roads in favour of cycling (support under railway crossing law); and
- the extension of operational routes on federal waterways for the purpose of cycling.

The development of cycle paths along federal roads will also continue. Particular attention will be paid to closing gaps in the cycling network. To this end, the Federal Government has maintained the funds for the construction and maintenance of cycle paths on federal roads. By awarding grants for fast cycle paths, the Federal Government supports the Länder, municipalities and associations of municipalities in setting up a sustainable transport system designed for fast cycling and usable with low loss times. The aim is to encourage the switch to the bicycle.

The existing shortages of skilled workers in local municipalities are being countered by means of a training plan, the 'Inviting cycling networks' course and other training and networking events for civil engineers, transport and urban planners at the Federal Mobility Forum. The seven Foundation professors of cycling are also an important pillar to ensure sustainable training and research on sustainable mobility.

Cycling also benefits from the creation of a more environment conducive to cycling. For example, the Law on Road Transport was amended by the Tenth Act amending the Road Transport Act to take into account the objectives of climate and environmental protection, health and urban development, in addition to the fluidity and safety of transport. The aim is to give Länder and municipalities greater room for manoeuvre and make road transport more sustainable. Regulations based on the Road Transport Act and orders of local authorities based on these regulations may be issued in the future for the purposes of improving environmental protection, including climate protection, health protection or supporting urban development. The ease of transport must be taken into account and the safety of traffic must not be compromised, as the law expressly states. This new regulatory framework is already being used in a parallel procedure to change roads intraffic management.

Strengthening rail freight transport (SGV)

In the Federal Government's view, measures in the three areas of provision of efficient infrastructure and access to the network, strengthening the competitiveness and modernisation of the SGV, particularly through innovation, including digital automatic coupling, are crucial in order to shift goods to rail. In order to promote single wagon transport, price support facilities have been in place since 2020. Currently, the current

European standard of 740 metrestrain length for freight trains on many lines in Germany is not reached. By upgrading the 740 m network for freight trains, the German Government intends to change this and thus improve capacity, quality and costs. There is also a modern control and safetytechnology. In combined transport, the package of measures aims at efficiency gains and cost reductions (e.g. byreducing process and waiting times, optimising the use of resources at theterminal and upstream/post), by digitising informationprocesses and preparing information, and by digitally controlling transshipment facilities. In addition, the electrified freight network needs to be expanded and compacted.

The ‘Electrical Freight Railway’ development programme promotes the further electrification of rail freight lines. It also promotes ‘alternative propulsion techniques’ of rolling stock in freight transport.

Modernisation of inland waterway transport and use of shore-side electricity in ports

An increase in the share of inland waterway transport in freight transport is sought through the implementation of climate mitigation measures from the Inland Waterways Master Plan (May 2019). The support programme for the modernisation of inland waterway vessels will be further developed. Infrastructure improvements to bottlenecks (Urgent Needs Disposal Actions (MA-E)) will be implemented more quickly and a ballast law will be launched in which projects for later

Measures laws are identified. In addition, the abolition of shipping taxes, which has already been adopted and has been in force since 1 January 2019, is to be maintained. In order to enable them to switch to electricity and low-emission and low-polluting fuels, shore-side electricity surcharges in maritime ports will be reduced and temporarily support will be given to lower- and lower-polluting fuels. In the long term too, regulatory law will have to apply. The FuelEU Maritime Regulation introduced a shore-side electricity obligation for passenger and container ships.

3.1.3.iv. Where applicable, national policies, timelines and measures planned to phase out energy subsidies, in particular for fossil fuels

Phasing out fossil subsidies in G20/G7

The G20 agreed in 2009 to phase out inefficient fossil fuel subsidies in the medium term and reaffirmed this in 2023. The G7 has set itself the goal of eliminating inefficient fossil subsidies by 2025 and re-affirmed its commitment in 2023. In addition, thefastest possible phase-out of inefficient fossil fuel subsidies at COP28 in Dubai in 2023 was decided by all ParisAgreement states. Germany will carry out a more intensive and regular review ofsubsidies with regard to their climate impact (e.g. in the context of spending reviews) and will further develop reporting on subsidies harmful to the climate.

Federal Government subsidy report

As part of the FederalGovernment’s subsidy reporting refund, a sustainability

assessment of all subsidies is carried out every two years. The long-term economic, environmental and social effects of the subsidy in question, such as economic prosperity and care for the future, climate protection and resource conservation or employment, are examined and the results are documented in the subsidy report. The current 29. Subsidy report for the years 2021 to 2024 was adopted by the Federal Government on 30 August 2023. It points out that, with the 2023 draft climate change programme, the Federal Government agreed to present a reform plan to reduce or transform climate-damaging subventions into a less damaging climate impact. In this context, the Federal Government also intends to agree on a uniform framework for defining subsidies harmful to the climate. It plans to carry out a more intensive and regular review of subsidies for climate impact (e.g. in the context of spending reviews) and to further develop reporting on subsidies harmful to climate change. As a first step, in the context of the 2023 Climate Protection Report, the Federal Government has provided a first working definition of state benefits with a climate-damaging effect and a list of first events covered by this definition.

Measures for the rational use of energy and the use of renewable energies are described in detail in Chapter 5.2.2.

Comprehensive evaluation of tax benefits

In line with the guidelines on subsidies policy, all subsidies taken into account in the subsidy report must, in principle, be regularly evaluated in terms of the extent to which the objectives have been achieved, as well as in terms of efficiency and transparency. The Federal Government has most recently carried out a systematic evaluation of a total of 33 tax advantages listed in the subsidy report as part of a research report, in particular with regard to the objective, efficiency, instrumentality and, for the first time, their sustainability. The research project thus makes an effective contribution to evidence-based fiscal and fiscal policies. A major reevaluation also focused on energy and electricity taxation. The results of the evaluation reflect the opinion of the independent evaluators and were published on 30 October 2019. In their recommendations, the evaluators point out, in summary terms, that there are often divergent arguments in favour of and against changes to tax benefits, and it is up to the legislator to balance the advantages and disadvantages of possible reforms. In this sense, the Federal Government will examine the findings of the expert report with regard to the need for action or optimisation of the individual measures.

Phase-out of subsidies for hard coal

The most important measure in Germany to reduce fossil fuel subsidies was the phasing-out of coal subsidies. The German coal industry was not competitive, in particular because of its high geological production costs. In order to facilitate the socially acceptable phase-out of the coal industry, Germany granted subsidies for the sale of domestic coal in order to cope with the necessary closure measures and bridging aid for outgoing workers. Subsidies for the sale of domestic hard coal were paid for the last time for 2018 and the coal industry was then stopped. Post-closure activities were subsidised up to and including 2022. The granting of early retirement grants to outgoing

coal workers (adaptation allowance) expires at the end of 2027.

3.2. Energy efficiency dimension

Planned policies, measures and programmes to achieve the indicative national energy efficiency contributions for 2030 as well as other objectives referred to in point 2.2, including planned measures and instruments (also of a financial nature) to promote the energy performance of buildings, in particular with regard to the following: 3.2.i – 3.2.viii

The revised EU Energy Efficiency Directive (EED) provides for a significant increase in energy efficiency and a reduction in energy consumption. To this end, national energy efficiency policies have been adapted to the new objectives and targets. The Energy Efficiency Act, which entered into force on 18 November 2023, established a cross-sectoral framework to increase energy efficiency at national level.

The Federal Government's energy efficiency policy is based on a broad mix of instruments for all sectors based on the principle of 'advice and information, promotion, demand and research'.

built up. Below is a detailed description of the current key measures.

Based on the projection report Germany 2024, there is still a gap to reach the target of Germany's indicative national energy efficiency contributions by 2030. Based on the co-measure scenario of the 2024 projection report, primary energy consumption of 2 501 TWh or 9 004 PJ is forecast for 2030. A further 249 TWh or 896 PJ reductions must therefore be achieved in order to achieve the objectives. Based on the co-measure scenario of the 2024 projection report, final energy consumption of 2 069 TWh and 7 448 PJ is forecast for 2030. A further 260 TWh or 936 PJ reductions must therefore be achieved in order to achieve the targets.

3.2.1. Policies and measures related to the elements set out in point 2.3

For the implementation of former Article 7 of the EU Energy Efficiency Directive, the Federal Government used strategic measures and thus a broad set of measures in the first savings period of 2014-2020. This approach will also be maintained for the second savings period 2021-2030 for the transposition of point (b) of the first sentence of Article 8(1) of the Energy Efficiency Directive. An overview of the measures currently planned by Germany to achieve end-use energy savings in accordance with Article 8 EED depends on the present national energy and climate plan as an annex pursuant to Article 3(2)(h) of Regulation (EU) 2018/1999. These measures are expected to achieve cumulative end-use energy savings of 4 878.25 PJ or 116,52 Mtoe. This corresponds to 84.73 % of the savings obligation of a cumulative amount of 5 757.1 PJ or 137,51 Mtoe. Further measures are therefore needed to achieve the missing end-use energy savings.

Energy Efficiency Act

The Energy Efficiency Act (EnEfG), which entered into force on 18 November 2023, transposes the amended European Energy Efficiency Directive (EED). It sets a cross-sectoral framework to increase energy efficiency and contains energy consumption reduction targets for Germany. The law also includes concrete savings measures on the role of the public sector as a model and the increased use of energy and environmental management systems. The law also specifies energy efficiency and waste heat requirements for data centres and requirements to improve the prevention and use of waste heat.

Energy efficiency first principle

In all sectors, the ultimate principle is 'Efficiency First!'. This is now also laid down as a principle in the amended EED Article 3. The EnEfG has also made clear the political importance of the topic in Germany.

In the area of buildings, the 'energy efficiency first' principle is taken into account, inter alia, by the Buildings Energy Act, including its amendments which entered into force on 1 January 2023 and 1 January 2024. The objective of the Act is to save energy in buildings as renewable energy is increasingly used (see below in this chapter for more information). In addition to a requirement size for the Primary energy demand, the efficiency requirement ensures that energy is used efficiently. The Act is complemented by extensive funding possibilities that can increase the energy efficiency of the buildings in question, in particular federal funding for efficient buildings (see below in this chapter for more information).

In the heating sector, the Heat Planning Act, which entered into force on 1 January 2024 (see also Chapter 3.1.3 for more information), expresses the 'energy efficiency first' principle by creating system gains from heat planning and the basis for efficient heat supply.

Energy savings must in principle be estimated as part of heat planning. In addition, the presentation of planned sub-areas with increased energy savings potential (WPG §18(5)) as part of the potential analysis, within the meaning of the Energy Efficiency First principle, integrates demand-side solutions into heat planning. In addition, the Heating Planning Act (Section 21(1)) explicitly states that a thermal plan for a municipal area in which more than 45000 inhabitants are registered as of 1 January 2024 'with the 'energy efficiency first' principle laid down in Article 3 of Directive (EU) 2023/1791 of the European Parliament and of the

Council of 13 September 2023 on energy efficiency and amending Regulation (EU) 2023/955 (recast) (OJ L 231, 20.9.2023, p. 1).' Paragraph 17 of the EnEfG provides for the development of a platform for waste heat, which is intended to facilitate the injection of unavoidable waste heat by companies, for example, into the heat network.

Network development planning for electricity (as a planning decision within the meaning of Article 3(1) of Directive (EU) 2023/955) assumes, for example, efficiency gains on the consumer side and an efficient shift in energy demand towards electricity. Demand-side resources and flexibilities that can lead to a more efficient use of energy

and grids also feed into the foundations of network development planning (development of electromobility, power-to-heat/heat pumps, electrolysis, battery storage, demand side management in industry and industry). In addition, the current amendment to the EnWG (Third Act amending the Energy Industry Act) lays down requirements for a system development strategy and for coordination of the scenario frameworks or network development plans in the area of future energy infrastructure. The principle of efficiency can also be taken into account in the overall system development strategy. The coordination of scenario frameworks and network development plans ensures a rigorous and consistent consideration of energy efficiency in energy infrastructure planning. To sum up, it can therefore be concluded that the process of network development planning is sufficiently flexible to take due account of the energy efficiency aspect in the relevant planning decision.

Climate Action Programme 2023

The 2023 Climate Action Programme also includes many measures that, in addition to decarbonisation, lead to the reduction of primary and final energy consumption (see Chapter 3.1.).

3.2.11. Long-term renovation strategy to support the renovation of the national stock of residential and non-residential buildings, both public and private, including policies, measures and actions to stimulate cost-effective deep renovation and policies and actions to target the worst performing segments of the national building stock, in accordance with Article 2a of Directive 2010/31/EU

In accordance with Article 2a of the EU Directive on the energy performance of buildings, the Federal Government has submitted to the European Commission a 'Long-Term Renovation Strategy (LTRS). The LTRS aims to establish a roadmap for each Member State with measures and nationally defined measurable progress indicators to achieve the long-term climate targets and to identify pathways and incentives for the renovation of the national building stock. The amended EU Buildings Directive entered into force at the end of May 2024 and is due to be implemented by 29 May 2026. It describes the objective of achieving a highly energy efficient and decarbonised building stock by 2050 and the transformation of existing buildings into zero-emission buildings (EPBD, Directive (EU) 2024/1275). In principle, the following applies to the building area: in order to significantly reduce non-renewable primary energy consumption, efficiency measures must significantly reduce the energy demand for heating and cooling and significantly increase the share of renewables in meeting the remaining needs. Measures such as insulation of the building envelope, installation of efficient windows or other façade components, airtight construction of buildings and the use of high-efficiency technical systems for heating, cooling and light and lighting technology can increase the potential for efficiency. The measures implemented so far to meet the energy and climate targets have made significant progress on climate change mitigation and energy efficiency, reducing greenhouse gas emissions in buildings by around 51 %

between 1990 and 2023, to 102 Mt CO₂equivalents, decoupled from economic growth and despite the sharp increase in residential space (1990: 210 million tonnes of CO₂equivalents). The share of renewables in final energy consumption for heating and cooling increased by around 15 percentage points over the same period to 17.4 % in 2022. In the building sector, federal funding for efficient buildings (with its The CO₂ BuildingRenovation Programme, the Market Incentive Programme (MAP), the Energy Efficiency Incentive Programme (APEE) and the Heating Optimisation Programme (HZO) are given a significant boost to energy efficiency and the share of renewable energy in buildings, which have contributed significantly to these positive developments. Nevertheless, scientific analysis shows that there is a need to speed up these developments to achieve the 2030 targets. In order to make the necessary progress in increasing energy performance and reducing CO₂ emissions in thebuildingsector, an emergency programme for the building sector was developed in 2022. This has been further developed and taken up in the 2023 Climate Action Programme.

Measures in the field of buildings must in principle be made operational, technology-open and cost-effective and interlinked across trades in such a way that barriers are addressed, support measures are broadened, the high quality of renovation measures is ensured and the potential for energy efficiency and use of renewable energy in buildings is considered together.

There is no comprehensive revision of the LTRS as part of the NECP update. However, measures have been further developed and complemented. This evolution is set out below.

Energy advice

The Federal Support for Energy Advice for Housing (EBW) is aimed at owners of residential buildings (private homeowners, housing associations and communities of homeowners). A qualified energy consultant from the energy efficiency expert list (<https://www.energie-effizienz-expert.de/>) examines the entire property and draws up a comprehensive energy advisory report, the so-called individual renovation roadmap (iSFP). In addition to energy saving potentials, the use of renewable energies and the necessary investments are also estimated, as well as the potentialheatingCost and CO₂ savings. Energy advice thus helps to:

Include energy efficiency and renewable energies in the planning and decision-making process of owners, thus exploiting the efficiency potential at the most cost-effective time. This will makebuildings more aware of the added value of energymodernisation measures. This is because investments are most useful if they are linked to pending maintenance or modernisation measures.

Since January 2021, the Energy Advice for Non-residential Buildings, Plants and Systems (EBN) summarises the Energy Advice in Small and Medium-sized Enterprises (EBM) and the Energy Advice for non-residential buildings of municipalities and non-profit organisations (EBK), including the Contracting-Check. Support is targeted at

municipalities, small and medium-sized enterprises (SMEs), municipal enterprises and non-profit organisations, as well as other possible beneficiaries. Advice is provided on the renovation of, for example, schools, kindergartens and administrative buildings, as well as on the energy optimisation of business processes.

The individual and independent energy advice supported by the BMWK on energy saving opportunities, energy efficiency issues, the use of renewable energies and other energy-related issues for private consumers is organised by the Verbraucherzentrale Bundesverband e.V. (vzbv) and carried out with the participation of the consumer centres of the Länder. Energy advice is currently provided in around 1000 advisory centres throughout Germany. There are personal consultations, telephone consultations, online consultations, energy checks or on-site advice on various topics at home or home (e.g. on electricity and heat consumption, heating technology, the use of renewable energies, e.g. solar heat or photo-voltaic). Webinars are also regularly offered to private consumers.

National efficiency label for old heating systems

Since 2017, the national efficiency label for old heating systems has informed consumers about the efficiency status of their boilers over 15 years old and aims to motivate them to replace inefficient boilers.

Under Section 17 of the EnVKG, district chimney sweeps are legally obliged to display the label and receive compensation for expenses. The measure is to be abolished by the end of 2024, inter alia, on the basis of evaluation results, changes in the legal situation (including JITs) and alternative means of communication.

Buildings Energy Act

The new construction standard in terms of permissible primary energy demand was raised to the efficiency house 55 in an initial amendment to the JIT. The amendment to the Building Energy Act entered into force on 1 January 2023.

On 1 January 2024, amendments to the Building Energy Act (GEG) entered into force at the same time as the Heat Planning Act (WPG). The 2nd JIT amendment provides that, in principle, any newly installed heating should initially use at least 65 % renewable energy only in new building areas as of 1 January 2024 (cf. Section 71(1), paragraph 8, first and second sentences of the GEG (new)). Newly installed heating in existing buildings and in new buildings outside new construction areas, i.e. in building gaps, is subject to this obligation only with the deadlines corresponding to heat planning in accordance with the Heat Planning Act. I.e. from 1 July 2026 for buildings located in municipal areas with more than 100.000 inhabitants and from 1 July 2028 for buildings in all other municipalities. This time limit may be advanced if, taking into account a thermal plan, a (separate) decision is taken on the designation as an area for new or expanding heat networks or as a hydrogen network expansion area. Fossil fuel heating systems that are installed after 1 January 2024 and before the 65 % RES target applies must use climate-friendly fuels proportionally from 2029 (cf. § 71(9) GEG (new)).

Where heating using a solid, liquid or gaseous fuel is installed before those dates, advice shall be required to indicate the possible effects of designating an area for the construction or expansion of heat networks or as a hydrogen network expansion area as a result of heat planning and possible inefficiency, in particular due to rising CO₂ pricing. In addition, oil and gas heating systems to be installed in the transition phase will have to use gradually increasing shares of green gases or so-called green heating oil as of 2029.

Existing heating systems are not affected by the rules and can continue to be used. Even if repair is about to take place, there is no need to replace heating. The switch to renewable energies is technology-open.

The Heat Planning Act and the Buildings Energy Act take into account (climate-neutral) gases that are not yet available at present. In addition, where an area is designated for the construction or expansion of heat networks or as a hydrogen network expansion area, existing heat plans must meet the need for adaptation in order to designate one or more of the following:

Hydrogen network expansion areas are examined. The aim is to ensure that there is also a realistic option to switch to a hydrogen network for existing or under preparation heat plans.

The Buildings Energy Act contains further transitional provisions, e.g. when connection to a heat network is envisaged, and a general hardship rule allowing for exemptions from the obligation upon request.

Regulation on the security of energy supply via short-term effective measures (Short-Term Energy Supply Security Ordinance, EnSikuMaV)/Order on safeguarding energy supply over medium-term measures (Medium-term energy supply security measures, EnSimiMaV)

In order to specifically prevent gas shortages, the German Federal Government implemented several measures. These include, on the basis of the Energy Security Act (EnSiG), the Ordinance on security of energy supply over short-term effective measures (Short-Term Energy Supply Security Measures Ordinance, EnSikuMaV), limited until April 2023, and the Ordinance on the security of energy supply over medium-term effective measures (Medium-Term Energy Supply Regulation, EnSimiMaV), limited to autumn 2024, to reduce the consumption of natural gas by industry and households to crisis-adequate levels. The temporary short-term energy savings measures aimed, inter alia, at: Minimum temperature requirements;

Information obligations and prohibitions on heating public common areas and on night-time operation of illuminated buildings. The EnSimiMaV's measures defined a commitment on the part of building owners to optimise the heating systems of their buildings. Paragraphs 2 and 3 of the EnSimiMaV on heating optimisation and hydraulic reconciliation are transposed into the Building Energy Act (Sections 60b and 60c) as measures to improve the energy efficiency of heating systems after the expiry of the time-limit of the Regulation. The relevant provisions were adopted in the amended

BuildingEnergy Act and – unlike the other provisions of the Buildings Energy Act – enter into force on 1 October 2024.

Federal Support for Efficient Buildings (BEG) – Stock

The Federal Support for Efficient Buildings (BEG) supports measures to increase energy efficiency in residential and non-residential buildings and, inter alia, the replacement of old, fossil-based heating with renewable heating. Full renovations to the efficiency house standard are supported by low-interest loans from the KfW with repayment grants and individual measures, in particular on the building envelope through grants from the BAFA. The new feature since January 2024 is that the subsidies for renewable heat generators can be applied for from the KfW. There are special support incentives (bonus) for the renovation of poor energy buildings, implementation as serial renovation and heat pumps that are particularly efficient or use natural refrigerants.

The following investment subsidies have been available for the replacement of heating since January 2024:

- a basic support of 30 % for all residential and non-residential buildings for all categories of applicants; an additional 5 % efficiency bonus is also available for heat pumps using water, soil or wastewater as a heat source or using a natural refrigerant;
- a 20 per cent climate speed bonus by the end of 2028 for the early replacement of old fossil heating systems (as well as night storage heaters and old ones (Biomass heating) for beneficial owners;
- and an income bonus of 30 % for owner-occupiers with up to EUR 40,000 taxable household income per year.
- Bonuses can be cumulated up to a maximum aid rate of 70 %.

A supplementary loan – up to EUR 90,000 of annual taxable household income at reduced interest rates – is also available for heating exchange and other individual efficiency measures.

Federal Support for Efficient Buildings (BEG) – climate-friendly new construction

On 1 March 2023, the climate-ambitious and holistic support programme ‘Climate-friendly new construction’ (KFN) was launched and, as of 1 June 2023, the ‘Housing for Families’ funding programme – WEF. New buildings, both residential and non-residential, are characterised by low life-cycle greenhouse gas emissions, high energy efficiency, low operating costs and a high share of renewable energy for the production of heat and electricity. It looks at the whole life cycle of the building, from construction through operation to potential dismantling in the distant future.

Support programme for climate-friendly new construction in the low-price segment

For 2024 and 2025, a new programme is also planned for 'climate-friendly new construction in a low-price segment' (working title) with a total funding volume of EUR 2 billion. The aim of this programme is to support new buildings which, in addition to the statutory energy efficiency standard (EH55), have an impact on saving at least equivalent to the CO₂ savings of EH40 over the life cycle.

Support of serial refurbishment

The Federal Government supports the industrial prefabrication of façade and roof components and a standardised installation of plant technology through federal funding for Serielle Rehabilitation. Feasibility studies, pilot projects and production capacity building will be supported.

In addition, the Federal Government has introduced a bonus of 15 per cent points for serial renovation within the Federal Government of support for efficient buildings. The aim is to bring into practice the approaches developed in the framework of the pilot projects carried out. The aim is to renovate buildings at high quality and shorten refurbishment times.

Law on Heat Planning and Decarbonisation of Heat Networks

The Federal Act on Heat Planning and Decarbonisation of Heat Networks (Heat Planning Act) introduced heat planning on 1 January 2024 as a central strategic tool for heat transition (cf. 3.1.2.1.c), 3.1.2.vi. and 3.1.3.ii.). The law lays down requirements for the decarbonisation of heating networks by 2045.

Federal support for efficient heat networks (BEW)

Since September 2022, federal funding for efficient heating networks (BEW) has been providing financial support for the development and transformation of heating networks towards climate neutral heat supply (cf. 3.1.2.iii).

Heat pump offensive

Heat pumps are, among other technologies, a compliance option under the Buildings Energy Act, in the context of the increasing use of CO₂ prices. In all known scenarios, heat pumps are a key technology for decarbonising the building sector. Based on a decision of the Federal Government, Germany launched a heat pump offensive together with stakeholders in spring 2022, with the aim of installing at least 500.000 heat pumps per year from 2024. All stakeholders have expressed their willingness to take the necessary implementation steps in their respective spheres of responsibility and have reaffirmed them at three heat pump summits so far. Stakeholders have agreed on measures: further development of heat pumps in terms of efficiency, natural refrigerants, improvement of the framework conditions for heat pumps in the building stock;

Tax incentives for energy renovation of buildings

As a measure in the buildings sector, tax incentives for energy renovation of buildings used for own residential purposes were introduced as of 1 January 2020. Since then, the instrument complements the existing support schemes in the building sector and can be used as an alternative to the investment support programmes. The tax reduction is designed as a deduction from the individual tax liability. In order to obtain the tax incentive, the costs incurred must be declared to the tax office as part of the income tax return. The certificate of the operations carried out must also be submitted. Support will be provided for individual renovation of owner-occupied dwellings, which are also considered eligible under the existing building support programmes. These include individual measures such as, in particular, the replacement of heating, but also the installation of new windows or the insulation of roofs and external walls. 20 % of the investment costs (max. EUR 40,000 per residential property) are eligible; which are deductible for tax purposes over three years.

Energy-efficient urban redevelopment

Since 2011, the KfW programme for energy-related urban regeneration has supported climate change mitigation and adaptation measures through district-related approaches and their follow-up by means of renovation management with grants (KfW programme 432). Selected district-related infrastructure measures were supported by subsidised funding loans (KfW programmes 201/202).

The programme promoted neighbourhood-related climate action and links it to other urban planning aspects. Integrated neighbourhood concepts show energy saving potentials and options for the use of renewable energy. The programme expired at the end of 2023.

Further development of the future construction innovation programme

The construction sector faces particular challenges: The transition to net-zero climate and greenhouse gas emissions by 2045 must be shaped, the resources available and the need for green and affordable housing needs to be met. At the same time, unstable supply chains, scarcity of materials and increased prices make it increasingly difficult to reduce the current overhang in building permits at an acceptable cost and in reasonable time.

In order to fulfil these tasks, all those involved in construction research – the Federal Government and other institutions as promoters, research and construction practices – have a share of responsibility. Application-oriented construction research should provide new impetus for a sustainable transformation of the entire construction sector.

Energy Transition Buildings

The Energy Transition Building Research Initiative brings together the promotion of research, development and demonstration for energy efficient buildings and neighbourhoods, helps to network the wide range of research fields and increases awareness of energy innovation through targeted outreach. It is an element of energy

research support and does not constitute a stand-alone support programme.

The building sector has a key role to play in the heat transition in unlocking efficiency potential and integrating renewable energies. The systemic interaction between buildings, neighbourhoods and energy infrastructure is becoming increasingly important. Accompanying research on energy transition projects evaluates the results of research and demonstration projects and prepares them in such a way that they can be permanently incorporated into planning and decision-making practice.

The support measure “EnEff. Building.2050” will be implemented under the 7th BMWK’s energy research programme entitled ‘Climate-neutral 2050 building stock’. The support measure complements the R & D and demonstration projects in the Energy Transition Building Research Initiative. The objective of the action is to achieve a significant reduction in non-renewable primary energy demand by speeding up the deployment of available but novel technologies and processes. It will take on board innovations and results from long-standing research and the focus on removing barriers to enable the exemplary implementation of ambitious projects on the path to a climate-neutral building stock.

Example-setting role of federal buildings

In order to serve as an example for federal buildings, the energy efficiency provisions for climate neutral new/extension buildings and building renovations by the Federal Government (EEFB) for new buildings and renovation projects (constructions of direct and indirect federal administration) are implemented as minimum construction requirements in accordance with the Cabinet decision of 25 August 2021.

The EEFB defines the current energy standards for federal buildings in order to fulfil their exemplary role and to achieve the climate policy objectives for the federal buildings. The key points for energy efficiency determinations were set out in the 2030 Climate Change Programme. Accordingly, the EGB 40 efficiency building standards for new buildings and EGB 55 for building renovations were laid down in the EDFB, in line with the Federal Funding for Efficient Buildings (BEG) classification. The relevant EDFB requirements go beyond the legal requirements laid down in the Buildings Energy Act for annual primary energy requirements (use of renewable energies) and for building heat protection (building envelope).

In order to achieve the climate targets set for the federal buildings, annual renovation rates are also set by 2045. The aim is to bring the entire building stock to a renovation by 2045, taking into account a corresponding start-up period.

EDFB is therefore a step towards achieving net zero greenhouse gas emissions for the federal buildings.

Further development of urban development support (StBauF)

Since 1971, the Federal Government-Länder programme has helped cities and municipalities to remedy urban development problems and thereby strengthen them in a sustainable manner as economic and residential sites. In doing so, consideration must also be given to strategies to address the challenges posed by climate change. As part of the further development of urban development support in 2020, climate mitigation and adaptation measures have therefore been better addressed. They are now a mandatory eligibility condition and at the same time eligible for funding in all sub-programmes of urban development support. In particular, funding can be used to improve green infrastructure, such as the creation, maintenance or extension of green spaces and open spaces and the interconnection of green and open spaces. For example, measures for energy renovation of buildings, soil sealing, land recycling, climate-friendly mobility, the use of climate-friendly building materials, greening of building sites or increasing biodiversity are also eligible for support.

Rehabilitation of municipal institutions in the fields of sport, youth and culture

The federal programme 'Rehabilitation of municipal institutions in the fields of sport, youth and culture' aims to support municipalities in the ambitious energy renovation and modernisation of their social infrastructure facilities. The Federal Government thus contributes to the dismantling of the existing renovation backlog of these facilities, in particular swimming halls and sports facilities.

Since the 2022 funding round, the projects to be supported must contribute to achieving the objectives of the Climate Change Act in the buildings sector and meet high energy requirements with the aim of significantly reducing GHG emissions. In exceptional cases (economic viability and more effective variant in terms of climate protection), replacement new buildings are also eligible. In addition, measures in open-air baths, including their ancillary constructions, are eligible for aid.

Once the renovation measure has been completed or the replacement of the new building has been completed, energy efficiency building levels must be reached for the first time in buildings. In the case of outdoor baths, support shall be given, in particular, to measures to achieve the most climate-neutral heating supply possible or to increase the share of renewable energy.

3.2.iii. Description of policies and measures to promote energy services in the public sector and measures to remove legal and non-regulatory barriers to the use of energy performance contracting and other energy efficiency service models

The Federal Government has taken extensive policy measures to remove barriers to the uptake of energy services in the public sector. These range from information, training opportunities and support programmes.

Promotion of consultations on energy-saving contracting within the framework of the EBN

The above-mentioned advisory programme 'Energy consultancy for non-residential buildings, installations and systems' (EBN, see Chapter 3.2.ii.) also supports 'contracting guidance advice' for municipalities, among other things.

Federal-Länder Dialogue Contracting

The project will provide a platform for intensive exchanges on energy-saving contracting between representatives from the Federal Government and the Länder. The project aims to remove barriers to the implementation of energy-saving contracting and to build up regional expertise in this area. This will be done through annual plenary meetings and workshops, as well as a mentoring programme and the exchange of examples of best practice. The development of regional centres of excellence is also supported.

Information on standard contracts and guides

The Federal Office for Energy Efficiency provides information on free-of-charge standard contracting contracts and guidelines on energy-saving contracting on its website. This includes offers specifically aimed at public properties or local authorities.

Municipal networks on energy and resource efficiency

Municipalities can form a network within the framework of the Local Guidelines of the National Climate Change Initiative (NKI) to improve their energy and/or resource efficiency. Together, they can identify and implement savings through the support of a network team.

3.2.iv. Other planned policies, measures and programmes to achieve the indicative national energy efficiency contributions for 2030 and other objectives referred to in point 2.2 (e.g. measures to promote the exemplary role of public bodies' buildings and promote energy efficient public procurement, measures to promote energy audits and energy management systems, consumer training and information and training measures, other measures to promote energy efficiency)

The following list provides an overview of non-exhaustive energy efficiency measures.

Additional measures are needed to achieve the ambitious savings targets.

CO₂ -Pricing

CO₂- Pricing in the heating and transport sectors (BEHG)

Carbon pricing for the transport and heat sectors is a key tool in the middle of an efficient and increasingly important mix of instruments. In addition to its role in decarbonisation, it is a key tool to increase energy efficiency. Reference is made to Chapter 3.1.1.i.

Carbon dioxide Cost Allocation Act

For the first time, the Carbon Dioxide Cost Allocation Act provides for carbon dioxide costs to be apportioned between landlords and tenants. Prior to the entry into force of the law on 1 January 2023, landlords were able to transfer all CO₂ costs to their tenants for the fuel. As a result, the price of carbon dioxide could not have the desired steering effect. This is because the incentive effect of the carbon dioxide price only affected the tenants and encouraged them to be more cost-efficient in heating. The Carbon Dioxide Cost Allocation Act now provides that the carbon dioxide costs incurred in residential buildings are to be apportioned on the basis of the energy quality of the building. The more this can be improved, the greater the share of carbon dioxide costs borne by the landlord (see Chapter 3.1.1.i.). For non-residential buildings, half of the division applies.

Product efficiency

Minimum efficiency standards – EU Ecodesign Directive

Regulatory measure: Extension of minimum standards for certain product groups to regulate the level of efficiency of technologies. In total, there are currently around 30 ecodesign regulations and two voluntary agreements.

Promoting the role of public authorities as role models

Exemplary role in the public building stock

Exemplary role of public bodies' buildings (new Article 6 EED)

An important part of the EU's energy savings is to be achieved through energy renovations. To this end, 3 % of the total floor area of heated and/or cooled buildings each year must be publicly owned. Facilities (Federal Government, Länder, municipalities) are renovated to at least nearly zero-energy buildings (NZEB) or zero-emission buildings (ZEB). In order to document progress, Germany, in consultation with the Länder, is developing a public building inventory. Germany has reported to the EU the use of the alternative approach set out in Article 6 EED. The corresponding estimated savings will be submitted later. Due to the difficult data situation, in order to accurately quantify the expected energy savings, it is necessary to draw up the building

inventory through which the public bodies of the Federal Government, the Länder and the municipalities are covered.

For federal buildings, see also Chapter 3.2.ii. on the long-term renovation strategy and exemplary role.

Energy efficient public procurement

The largest demand for goods and services in Germany is the public sector, with a total procurement volume of three-digit billions. Article 6 EED (Article 7 in the recast version applicable from October 2023) requires Member States to purchase only products, services and buildings with high energy performance, except for narrowly defined exceptions. The Public Procurement Regulation (Vergabeverordnung – VgV), which must be observed by all contracting authorities in connection with European-wide calls for tenders, states, in implementation of the EED in Section 67 (Procurement of energy-related supplies or services), that the highest level of energy efficiency and, where available, the highest energy efficiency class should be demanded if energy-related goods are purchased or they are essential for the performance of a service. Energy efficiency must also be used as an evaluation criterion when determining the most economical bid. For the award of works, Section 8c of the EU VOB/A (Procurement and Contract Regulations for Construction) contains a substantially identical provision. The standards will be aligned with the recast EED by October 2025.

In addition to this obligation, the Act against Restraints of Competition (GWB), the Procurement Regulation (Vergabeverordnung – VgV), the Procurement and Contract Regulations for Construction, Part A (VOB/A) and the Procurement Regulation for Defence and Security (VSVgV) promote such procurement. The Federal Office for Energy Efficiency also publishes lists of energy efficiency criteria for different product categories as complementary assistance to contracting authorities.

With effect from 1 January 2022, the General Administrative Regulation on the Procurement of Climate-friendly Services (AVV Klima) replaced the General Administrative Regulation on the procurement of energy-efficient services (AVV EnEff), which was already in force since 2008, in order to continue to ensure a high level of energy efficiency in all federal procurement procedures. The General Administrative Regulation on climate not only continues the requirements of the General Administrative Provision EnEff, but also supplements it with ambitious rules aimed at purchasing particularly climate-relevant products and services. For example, the General Administrative Regulation on climate provides specific guidance on aspects of the

Climate protection must be regularly taken into account in the preparation of the purchase, but also in the subsequent procurement procedure itself. In order to prevent or cause greenhouse gas emissions, a CO₂price must in principle be taken into account in procurement transactions (so-called ‘CO₂ shadowprice’). As a result, the amount of

CO₂emissions emitted over the whole life cycle is already taken into account as a cost factor in purchasing.

In order to facilitate practical guidance, the General Administrative Regulation on Climate also includes a 'negative list' of services that are not to be procured. These particularly climate-relevant products include, for example, heating mushrooms or many products using fluorinated greenhouse gases as refrigerants. Similarly, certain products are no longer allowed for resource and climate protection reasons, such as drinks in single-use packaging or single-use tableware in canteens and major events.

The importance of ensuring accelerated procurement is to be taken into account in the application of the WSR Climate and in the implementation of the measures under the sustainability programme – further development in 2021 (see Chapter 3.1.3.ii).

From a prospective perspective, the General Administrative Regulation on climate is to be further developed, taking into account relevant environmental aspects, in particular the protection of resources, into a general regulation on environmentally and climate-friendly procurement.

Energy audits/energy management system

Energy audit obligation for non-SMEs

The obligation to carry out energy audits for companies laid down in Sections 8 et seq. of the Energy Services Act (EDL-G) is considered here. According to that provision, large enterprises (non-SMEs, i.e. enterprises not covered by the European Commission's SME definition (& 250 employees or turnover & EUR 50 million or annual balance sheet total & EUR 43 million) are obliged to do so until 5. Carried out an energy audit in accordance with DIN EN 16247-1 on December 2015, followed by a further audit at least every four years. Companies using a DIN EN ISO 50001 certified

Energy management system or EMAS

Have an environmental management system exempted from the obligation to carry out energy audits.

The 2019 amendment introduced a de minimis threshold of 500 MWh of total energy consumption. Below this threshold, a simplified energy audit can be carried out to the BAFA by means of a declaration on energy consumption and energy costs. An online energy audit declaration was also introduced. This includes information on the company, the energy auditor, the energy consumption, the proposed energy efficiency-measures and the costs of an energy audit.

The obligation to carry out energy audits is based on the requirements of the Energy Efficiency Directive (Directive (EU) 2023/1791 of the European Parliament and of the Council of 13 September 2023 on energy efficiency and amending Regulation (EU) 2023/955 (EED), the recast of which entered into force on 10 October 2023. In

particular, there have been significant changes in the area of mandatory energy audits for companies. Under the old legal position (old version of Article 8 of the EED), the obligation to carry out energy audits was based on the size of the undertaking (see above). In future, under Article 11, as amended, all undertakings with high energy consumption will be required to carry out energy audits, irrespective of the size of the undertaking.

For the impact assessment of the measure, the evaluation of the audit obligation under the Energy Services Act (EDL-G) (Adelphi and IREES 2017) is used. As part of this evaluation, a sample of companies subject to EDL-G was interviewed. Both the potentials identified during the audits and the EMS and the measures implemented were examined. The impact of the measures estimated here only addresses the measures not yet implemented, which were identified as part of the audits or the EMS. The effect of the EMS is attributed to the 'Spitzenausgleich' and 'Special Compensation Scheme' measures.

Obligation to implement energy management systems

Pursuant to Section 8(1) of the Energy Efficiency Act (EnEfG), which entered into force in November 2023, all companies with an annual average final energy consumption of more than 7.5 GWh are required to set up a certified energy management system in accordance with DIN ISO 50001 or a certified environmental management system under EMAS. The EnEfG is currently being amended as part of the draft law amending the Law on energy services and other efficiency measures, amending the Energy Efficiency Act and amending the Energy Labelling Act. The threshold will therefore be raised to 2.77 GWh in the future. The obligation is based on the requirements of the Energy Efficiency Directive (Directive (EU) 2023/1791 of the European Parliament and of the Council of 13 September 2023 on energy efficiency and amending Regulation (EU) 2023/955 (EED), the recast of which entered into force on 10 October 2023. Companies that have an energy management system certified in accordance with DIN EN ISO 50001 or an EMAS environmental management system are exempted from the obligation to carry out energy audits under the EDL-G (see above).

The support programme 'Energy and Resources Efficiency in the Economy' also supports the acquisition and installation of measurement, control and control technology and sensory technology for monitoring and efficient regulation of energy flows for integration into an energy management system. The purchase and installation of energy management software and the training of staff by third parties in the use of the software will also be promoted. In addition, the possibility of setting up an energy management system is also included in an EBN.

List of suppliers from the Federal Energy Efficiency Agency (BfEE)

The Federal Agency for Energy Efficiency (BfEE) keeps a free public list of energy service providers, energy audits and other energy efficiency measures operating

throughout Germany. In the list of suppliers, final customers can search for suppliers of certain energy efficiency services in their postal code area and compare them on the basis of different criteria. Suppliers can present their offer of energy services in the list of suppliers.

Energy efficiency and climate protection networks

Energy Efficiency Networks (EEN) bring together companies that share energy efficiency and CO₂ reduction targets and learn from each other. Following a successful pilot phase of the EEN concept (including the LEEN (Learning Energy Efficiency Networks) project), the Federal Government decided in 2014 to implement EEN as a key pillar of the National Energy Efficiency Action Plan (NAPE). Up to 500 new networks should be established by 2020. To this end, a voluntary agreement on the introduction of EENs was signed in 2014 between the Federal Government (BMWi and BMU, now BMWK and BMUV) and now 22 business associations and organisations. In total, this is expected to save 75 PJ of primary energy and 5 M_tCO₂eq. Emissions are avoided. On 14 September 2020, the continuation and further development of the Energy Efficiency Networks initiative was agreed. By 2025, 300-350 additional networks are planned to save 9-11 TWh of final energy and an additional 5-6 Mt CO₂eq.

The networks should meet minimum requirements. This includes carrying out an energy audit at company level, setting a savings target at network level on the basis of individual company targets and lifting the identified savings potentials in accordance with the network objective. The networks are supported by a qualified energy consultant. The measures implemented are recorded as part of an annual monitoring exercise. As of 4 August 2023, a total of 387 networks had been registered. The target savings are expected to be achieved according to the initiative. The quantification of this measure is bottom-up, based on parameters from the monitoring of the networks and the number and size of the networks.

On 14 September 2020, the then Federal Ministry of Economic Affairs and Energy (BMWi) and the Federal Ministry of the Environment, Nature Conservation and Nuclear Safety (BMU) together with 21 industry associations and organisations agreed to continue and further develop the Energy Efficiency Networks initiative (IEEKN 2020). The initiative, which was further developed into energy efficiency and climate action networks, started in January 2021. A total of 418 networks have now been registered (as at: 27 MAY 2024).

Consumer information/training

Independent advice at the Federal Association of Consumers and Consumers (vzbv)

See chapter 3.2.ii. on the long-term renovation strategy.

Federal support for energy advice for residential buildings (individual renovation roadmap)

See chapter 3.2.ii. on the long-term renovation strategy.

Federal support for energy consultancy for non-residential buildings, installations and systems (EBN):

See chapter 3.2.ii. on the long-term renovation strategy.

Small and medium-sized energy transition and climate change initiative

Launched in 2013 as a joint initiative by BMWi (now BMWK), BMU (now BMUV), DIHK and ZDH, the aim of the Energy Transition and Climate Change Initiative (MIE) is to strengthen dialogue between policy makers and SMEs in industry, commerce and crafts and to support SMEs in increasing energy efficiency.

The craft industry is to receive support for the implementation of energy saving and climate protection measures, along the lines of industry. The 1 million craft businesses with 5.62 million employees, as well as the 363.000 apprentices, are heavily affected by the energy and climate transition process. The MIE provides businesses with a suitable, tailor-made mix of tools and targeted support. The instruments will be implemented through a network of partners (seven craft environmental centres and 55 transfer partners (chambers, associations, guilds; Energy agencies)

Industry

EU ETS Innovation Fund: Further development of the NER300 programme

The programme focuses on emissions reduction. At the same time, however, it also has an impact on the reduction of primary energy consumption. Reference is made to Chapter 3.5.

National decarbonisation programme

The programme focuses on emissions reduction. At the same time, however, it also has an impact on the reduction of primary energy consumption. Reference is made to Chapter 3.5.

Programme CO₂-Prevention and use in basic material industries

The programme focuses on emissions reduction. At the same time, however, it also has an impact on the reduction of primary energy consumption. Reference is made to Chapter 3.5.

Further development of efficiency networks

The establishment of energy efficiency networks will be stepped up. To this end, in conjunction with the measure introducing a self-commitment by industry, the

implementation of recommendations from statutory energy audits or EMS will be accelerated and the continuation of the Energy Efficiency Networks initiative will be pursued in order to increase the transfer of know-how between companies.

Resource efficiency and substitution

It is only partly a new measure. It builds on the approaches to action set out in the German Resource Efficiency Programme. The objective of increased resource efficiency and substitution is to ensure the principle of circularity and/or Enshrine the electricity economy in production processes, thus unlocking untapped emission reduction potentials. The three main areas of guidance and information, support and training are described below.

Advice and information

In addition to energy efficiency, companies should provide information and advice on development and

Unlocking innovation with a focus on resource efficiency and substitution. The advice should build on the already existing offers of the Resource Efficiency Centre (CRE) and, where possible, be linked to advice on energy efficiency. As in the case of the cross-cutting advisory activities of the ZRE, the focus of corporate advice should be on SMEs, as SMEs often have neither time nor human resources to verify the responsiveness of their own businesses. The use of environmental management systems will be increased (ProgRes II). Energy audits have so far only measured energy consumption, and an explicit resource efficiency audit could be included in ProgRes II, as proposed.

Encouragement

Financial resources are needed to enable companies, in particular, to implement broader investment measures to successfully integrate and increase resource efficiency within and along the value chain through digitalisation and Industry 4.0. An increase in the use of CO₂ neutral raw materials and the use of secondary materials could also be envisaged. Special attention should be paid to SMEs, as investment costs are more costly for SMEs than larger ones. In order to demonstrate material and related greenhouse gas emissions savings, a resource efficiency concept listing the savings and describing possible secondary effects is required. Support should focus on the use of resource-efficient processes and materials and resource substitution for lightweight construction (see section 3.5.iii for more information on the support programme for lightweight construction).

KfW efficiency programme – production facilities/processes

The KfW Energy Efficiency Programme supports energy efficiency measures in the production facilities and processes of commercial companies with low-interest loans.

Support will be given to all investment measures that achieve energy savings of at least 10 % (entry-in standard). Both modernisation and

New investments in machinery/plant/process technology, compressed air/vacuum/absorbing technology, electric drives/pumps, process heat/cooling, heat recovery/waste heat utilisation, measurement, regulation and control technology, information and communication technology and CHP installations. The maximum loan amount is typically up to EUR 25 million per project. There is a choice of different loan terms (5, 10 or 20 years).

Further training and vocational training

In order to stimulate innovation and implement investment appropriately, specific training of staff is also needed. Further training should build on existing offers from the ZRE. The nationwide pool of qualified advisors already established by ZRE in cooperation with the Länder (under VDI Directive 4801) can be used for the congratulations referred to in point (i).

Energy and electricity tax concessions

The Federal Government will examine on a case-by-case basis the extent to which existing energy or electricity tax incentives should be even more closely aligned with the Federal Government's climate policy objectives. This review must take into account the votes on the draft new Energy Tax Directive (ETD) presented by the European Commission as part of the Fit-for-55 package.

The tax benefits existing in energy and electricity tax law for manufacturing industries are intended to prevent companies in international competition from being penalised by high electricity and energy costs. In addition to full tax relief for certain energy- and electro-intensive processes (e.g. electrolysis, metal processing, manufacture of glassware, ceramic products), companies in the manufacturing sector can benefit from a general energy tax relief of 25 % if all the conditions are met. In addition, the general discharge in the Electricity Tax Act was temporarily extended to the EU minimum tax rate as part of the electricity price package. In addition, the

Electricity tax exemptions for electricity produced from renewable energy sources and from high-efficiency cogeneration plants are an incentive for electrification of processes and decentralised production and use of electricity.

Traffic

Strengthening rail passenger transport

The programme focuses on emissions reduction. At the same time, the programme also

has an impact on reducing primary energy consumption. Reference is made to Chapter 3.1.3.

Making local public transport more attractive

The programme focuses on emissions reduction. At the same time, the programme also has an impact on reducing primary energy consumption. Reference is made to Chapter 3.1.3.

Development of cycle paths and bicycle parking options and improvement of framework conditions

The programme focuses on emissions reduction. At the same time, the programme also has an impact on reducing primary energy consumption. Reference is made to Chapter 3.1.3.

Strengthening rail freight transport

The programme focuses on emissions reduction. At the same time, the programme also has an impact on reducing primary energy consumption. Reference is made to Chapter 3.1.3.

Modernisation of inland waterway transport and use of shore-side electricity in ports

The programme focuses on emissions reduction. At the same time, the programme also has an impact on a reduction in:

Primary energy consumption. Reference is made to Chapter 3.1.3.

Expansion of refuelling and charging infrastructure

The programme focuses on emissions reduction. At the same time, the programme also has an impact on reducing primary energy consumption. Reference is made to Chapter 3.1.3.

Promotion of low-CO2 trucks

The programme focuses on emissions reduction. At the same time, the programme also has an impact on reducing primary energy consumption. Reference is made to Chapter 3.1.3.

Refuelling, charging and overhead contact line infrastructure

The programme focuses on emissions reduction. At the same time, the programme also has an impact on reducing primary energy consumption. Reference is made to Chapter 3.1.3.

Enable transport to automate, connect, liquefied, innovative forms of mobility

The programme focuses on emissions reduction. At the same time, the programme also has an impact on reducing primary energy consumption. Reference is made to Chapter 3.1.3.

Tax promotion of electromobility (Law on further tax promotion of electromobility and amending other tax provisions)

The programme focuses on emissions reduction. At the same time, the programme also has an impact on reducing primary energy consumption. Reference is made to Chapter 3.1.3.

Agriculture

Energy efficiency in agriculture

The programme focuses on emissions reduction. At the same time, the programme also has an impact on reducing primary energy consumption. Reference is made to Chapter 3.1.1.i.

3.2. v. Possible description of policies and measures to promote the contribution of local renewable energy communities to the implementation of the policies and measures referred to in points (i), (ii), (iii) and (iv)

Reference is made to Chapter 3.1.2.v., which sets out the regulatory framework for the development of renewable energy communities.

3.3. vi. Description of measures to develop measures to utilise energy efficiency potentials of gas and electricity infrastructure

Reference is made to the system development strategy in Chapter 3.4.3.i.

3.4. vii. Where relevant, regional cooperation in this area

French-German Energy Platform

Germany cooperates closely with France in the field of energy efficiency on the basis of the 'Joint Energy Declaration' of 31 March 2015. The German-French Energy Platform of dena (Deutsche Energieagentur) and ADEME (Agence de l'Environnement et de la Maîtrise de l'Énergie), created in implementation of the Energy Declaration, includes two efficiency projects. The projects aim, on the one hand, at the preparation and exchange of best practice examples in the field of building renovation and, on the other hand, at working together to promote energy efficiency in industry.

German-Polish Energy Platform

Within the framework of the German-Polish Energy Platform, the dena (German Energy Agency) and KAPE (Krajowa Agencja) work

Poszanowania energii) together in a cross-border project on climate-neutral heating and the cross-border exchange of best practice examples in the German-Polish border area.

3.5. viii. Financing measures, including Union support and the use of Union funds, in the area at national level

Financing measures in the form of intensive support or price and incentive mechanisms are key components of efficiency measures. They complement other measures with targeted financial incentives to enable the implementation of energy efficiency measures in the different fields of application. Energy consumers can therefore reduce their energy bills in the long term. For businesses, investing in energy efficiency creates not only cost benefits, but also new opportunities in international markets.

Encouragement

The Federal Government has created a framework for increasing the development and diffusion of innovative energy technologies from Germany, inter alia by promoting efficiency measures and measures for the use of renewable heat. Investment support programmes thus complement the advisory and information services with targeted financial incentives to enable the implementation of energy efficiency measures in the various fields of application.

Energy consumers can therefore reduce their energy bills in the long term (see “Long-term renovation strategy”). For businesses, investing in energy efficiency creates not only cost benefits, but also new opportunities in international markets. For example, Germany exports to a significant extent goods used in connection with efficiency measures and renewable heat in the rational use and conversion of energy, such as energy-efficient electrical appliances, insulation materials, building plant technology or components for production processes. For the buildings sector, the measures to implement the Energy Efficiency Strategy for Buildings are set out in the “Long-term renovation strategy” in chapter 3.2.ii.

Federal support for energy and resource efficiency in the economy

The programme ‘Federal Support for Energy and Resource Efficiency in the Economy’ (EEW) is the broad supportprogramme for the decarbonisation of industry and business. In addition to support through classical (reimbursement) grants and low-interest loans under the Guidelines ‘Federal Support for Energy and Resource Efficiency in the Economy – Grant and Credit’, which consists of a total of six different support modules, funding competition is also offered under the Guidelines ‘Federal support for energy and resource efficiency in the economy – promotion competition’. In the context of the difficult economic situation and ambitious climate targets, both Directives were amended in February 2024. New is not just the promotion of the total investment costs rather than the extra investment costs. There is also a step-by-step model. For pre-

defined technologies such as machine tools, there is now a low-bureaucratic “basic support” (level 1). The share of support is higher for projects that save at least 30 % greenhouse gases (stage 2). An additional decarbonisation bonus (step 3) exists for electrification with renewable electricity, for off-farm waste heat utilisation and for the production and use of green hydrogen. Also part of the amendment: increasing the maximum amount of funding from EUR 15 million to EUR 20 million per project in support modules 2, 3, 4 and competition, and adjusting the funding rates in modules 1 to 4.

The EEW consists of the following support modules:

Module 1: Cross-cutting technologies

Module 2: Process heat from renewable energy sources

Module 3: Measuring, sensing and control technology, sensing and energy management software

Module 4: Energy and resource optimisation of plants and processes

Module 5: Transformation plan

Module 6: Electrification of small enterprises promotion competition

3.6. Dimension Energy security

3.6.1. Policies and measures related to the elements set out in point 2.3

Natural gas: Measures to preserve and, where necessary, improve the security of gas supply in Germany

Gas Preventive Action Plan

Measures to preserve – and where necessary – improve security of supply in Germany are described in the Preventive Gas Plan for the Federal Republic of Germany. It is to be prepared in accordance with Articles 8 and 9 of Regulation (EU) 2017/1938 of the European Parliament and of the Council of 25 October 2017 concerning measures to safeguard the security of gas supply and repealing Regulation (EU) No 994/2010 and builds on the results of the national risk assessment to be carried out by each Member State pursuant to Article 7 of Regulation (EU) 2017/1938. For the Federal Government, the national risk assessment is carried out by BNetzA. The Preventive Action Plan shall set out measures to prevent a gas supply shortage that meet the infrastructure and supply standards, reduce the likelihood of supply crises occurring, avoid regional supply shortages and increase resilience to supply crises. The update of the PAP on a rolling basis is still pending (as of May 2024).

Network Development Plan (NEP) – Gas and Hydrogen

Pursuant to Section 15a EnWG, transmission system operators are required to jointly develop the NEP Gas on a biennial basis. Together, they identify infrastructure needs for the next ten years. Distribution system operators shall provide the necessary

information for this purpose. The NEP Gas also always modelled a ‘security of supply scenario’ in which assumptions are made about the effects of possible supply disruptions (Section 15a(1) EnWG). Following approval by BNetzA, the NEP Gas is binding on TSOs.

In the draft Gas Network Development Plan 2022-2032 of 31 March 2023, the network development proposal includes a total of 140 measures with an investment volume of approximately EUR 4.4 billion. A total of 82 new measures have been added compared to the gas grid development plan 2020-2030. The additional measures proposed compared to the previous network development plan are largely linked to the changed flow situation in the transmission network due to the disappearance of Russian gas volumes. Against this background, and in order to ensure security of supply in the long term, network development measures are crucial for the future removal of LNG volumes. In addition, further expansion is needed for future gas-fired power plants and for the conversion of low calorific gas to gas with high calorific value.

As part of the legal regime for the second stage of accelerated hydrogen grid roll-out, network development planning for gas and hydrogen will be integrated in the future. The parliamentary process for this legislative amendment was completed in spring 2024. As part of this future rolling network development planning for gas and hydrogen, a draft scenario framework for a network development plan was presented on 1 July 2024, based, inter alia, on assumptions on the development of production, production, supply and consumption of gas and hydrogen. Building on this, the first integrated network development plan for gas and hydrogen will be prepared and confirmed by the regulatory authority by 30 June 2026. As part of this recurrent planning process, there is the possibility of a need- and scenario-oriented further development of the hydrogen core network, for example due to updated demand forecasts from different regions.

Provision of information

In order to ensure the security of gas supply, Section 15(2) EnWG obliges TSOs/DSOs to provide the necessary information to any other gas supply system operator connected to its own network. The obligation also applies to storage operators.

Reverse flow capacity

Transmission system operators shall be responsible for creating permanent bi-directional capacity for flows across all cross-border interconnections. To that end, they shall cooperate with the adjacent transmission system operator. Out of a total of 36 physical border crossing points, 15 border points currently have bi-directional physical flow capacity (excluding cross-border gas storage connections). These capacities are available on a permanent basis.

Memory

Sufficient availability of storage capacity with high storage capacity is central to

securing gas supply, especially in the event of supply shortages and covering seasonal fluctuations in consumption. There are currently commercial gas storage facilities in Germany with a total capacity of approximately 23 billion cubic metres at 41 sites. This means that Germany has the largest natural gas storage capacity in the European Union. The spatial distribution of the reservoirs extends almost to Germany as a whole, with regional priorities in the north-west due to geological conditions. In line with their security of supply obligations, dealers are responsible for the use of commercial storage facilities by holding sufficient quantities to secure the supply of natural gas storage customers to their customers, in particular during the cooling period and in the event of unexpected supply disruptions.

Measures to remedy or mitigate the consequences of a gas supply disruption

Although the gas supply situation in Germany is highly secure and reliable, in the event of a deterioration of the supply situation, there is the necessary national framework conditions and design rights for companies and public authorities to prepare and ensure the necessary cooperation and availability of measures among all the parties involved. The legal bases for the implementation of crisis and contingency planning in Germany are in particular the following national provisions which transpose Regulation (EU) 2017/1938 and EU regulations adopted in the context of crisis management: The

The Electricity and Gas Supply Act (Energy Industry Act, EnWG), the Act on the Security of Energy Supply (Energy Security Act, EnSiG) and the Ordinance on the Security of Gas Supply in a Supply Crisis (Gas Security Ordinance, GasSV). Measures to remedy or mitigate the consequences of a gas supply disruption within the meaning of Article 10 of Regulation (EU) 2017/1938 are described in the Gas Emergency Plan for the Federal Republic of Germany.

Act on Electricity and Gas Supply (Energy Industry Act, EnWG)

According to Section 1(1) of the EnWG, the purpose of the EnWG is 'to ensure the safest possible, cheapest, consumer-friendly, efficient and greenhouse gas-neutral supply of natural gas to the general public, which is increasingly based on renewable energy'. In this connection, the supply of protected customers is of particular importance in Regulation (EU) 2017/1938. Protected customers pursuant to Article 6(1) of Regulation (EU) 2017/1938 are defined in Germany in § 53a EnWG and include households, basic social services and district heating installations which cannot switch fuel to the extent that they supply household customers, standard load profile customers and customers providing basic social services. Gas supply undertakings shall also be required to supply natural gas to that customer group in the event of a partial disruption of supply of natural gas or in the event of exceptionally high gas demand. In Germany, this obligation is reflected in § 53a EnWG. Gas supply undertakings may use market-based measures (grid or market-related, non-sovereign) measures.

Supply to protected customers is only possible within the framework of the security and

reliability of the gas supply network. Transmission and distribution system operators therefore play a central role in their system responsibility for ensuring gas supply on the basis of Sections 15, 16 and 16a of the EnWG. If network or market-related measures prevent the system operators from remedying a disruption or threat to the security and reliability of the gas supply system in good time (Section 16(1) EnWG), this must be produced by the network operators by means of the measures referred to in Section 16(2) EnWG.

In particular in the event of a risk of gas shortages, system operation, allocation and planning of capacity, including transit capacity, must be carried out in such a way as to safeguard the security of supply of protected customers as well as solidarity protected customers in other Member States. The gas supply undertakings shall carry out these tasks under their own responsibility.

Energy Security Act (Energy Security Act, EnSiG)

The EnSiG's toolbox, in combination with the Gas Assurance Regulation (GasSV), is only used in an emergency to ensure vital gas needs in the event that the gas supply is directly endangered or disrupted and the threat or disruption of supply cannot be addressed by market-based measures, or cannot be addressed in a timely manner or only by disproportionate means. The need to fulfil public tasks and international obligations as defined in the EnSiG is also considered vital. The EnSiG's toolbox is put into effect by the fact that the Federal Government establishes, by means of a statutory ordinance, that there is a threat to or disruption of energy supply. This does not require the consent of the Bundesrat. In order to achieve the above objectives in the event of an emergency, provisions may be adopted by means of a statutory ordinance pursuant to Section 1(1) of the EnSiG concerning, inter alia, 'the production, transport, storage, distribution, levy, purchase, use and maximum prices of... gaseous energy sources (...)' and 'accounting, proof and reporting obligations relating to (the economic transactions referred to, the quantities and prices of those goods and other market conditions.'

The ordinance may, in particular, provide in paragraph 3 that 'the charge, purchase or use of the goods may be limited in time, geographically or quantitatively or only for certain urgent supply purposes.' The period of validity of such regulations may not exceed six months. Their period of validity may be extended only with the consent of the Bundesrat.

The Gas Assurance Ordinance was adopted on the basis of the EnSiG. While market-based instruments and measures by gas supply companies in Germany are enshrined in law in particular in the EnWG, EnSiG and GasSV define sovereign powers of intervention.

Regulation on the security of gas supply in a supply crisis (Gas Security Regulation – GasSV)

GasSV was adopted on the basis of the EnSiG. It regulates the transfer of burden-sharing

or sovereign measures to the competent public authorities in the event of an emergency. In the event of a supra-regional supply shortage, the competent public authorities are BNetzA and, in the case of a regional supply shortage, the Länder. In order to meet the 'essential demand' of natural gas, with particular regard to protected customers and the minimisation of consequential damage, these competent bodies may issue dispositions in accordance with § 1 GasSV as load distributors.

If intervention in the supra-regional interest, balancing electricity and natural gas economic concerns, or the use of natural gas storage facilities and other gas supply facilities of supra-regional importance is to be regulated, BNetzA, as the competent public body, assumes its role as federal load distributor. If an intervention does not have a cross-regional impact, the regionally affected federal state assumes the burden-sharing. As in most cases a gas shortage can be expected to have cross-regional effects, BNetzA has a central role as a power distributor at the emergency stage.

Natural gas emergency plan

The natural gas emergency plan shall be drawn up in accordance with Articles 8 and 10 of Regulation (EU) 2017/1938 concerning measures to safeguard the security of gas supply and shall allocate the measures to three crisis levels (early warning, alert and emergency levels). The occurrence of the relevant crisis level depends on the severity of the disturbance, the expected economic and technical impact and the urgency of resolving the disturbance at national level. The emergency plan was last updated on a rolling basis in 2023.

Ensuring supply to protected customers in a gas shortage/emergency stage.

Supply to protected customers is only possible within the framework of the security and reliability of the gas supply network. TSOs and DSOs therefore play a central role in their system responsibility for the security of gas supply on the basis of Sections 15, 16 and 16a of the EnWG. In particular in the event of a risk of gas shortages, system operation, allocation and planning of capacity, including transit capacity, must be carried out in such a way as to safeguard the security of supply of protected customers as well as solidarity protected customers in other Member States. The gas supply undertakings shall carry out these tasks under their own responsibility.

Possible measures within the framework of the orders pursuant to § 1 GasSV

To manage a wide range of processes to deal with emergency situations at the gas emergency stage;

Solidarity requests from EU Member States connected to Germany use the Gas Security Platform (SiPla) as a digital platform for data exchange and communication. On the basis of §1(1)(4) EnSiG in conjunction with § 1a GasSV, the security platform gas was developed by BNetzA and the market area manager for gas, Trading Hub Europe GmbH (THE). It has been made available by the market area manager since October 2022.

Through the security platform gas, under § 1 GasSV, BNetzA, in its role as federal load distributor, may issue injunctions to undertakings and undertakings producing, purchasing, transporting or supplying natural gas or operating gas storage facilities, as well as to consumers on the allocation, purchase and use of gas, as well as exclusion from the purchase of gas. Such injunctions constitute predetermined sovereign/non-market-based measures within the meaning of Regulation (EU) 2017/1938. Under §1 GasSV e.g. Orders to increase storage of natural gas, substitution of natural gas with oil or other fuels, use of non-gas generated electricity, restriction of electricity production in natural gas power plants, increase in production levels of natural gas, heating of public buildings, reduction of consumption of natural gas to large or other end-users, reduction of industrial customers, use of alternative fuel storage stocks, restriction of cross-border flows of natural gas

(subject to the requirements of Articles 10(4) and 11(6) of Regulation (EU) 2017/1938).

Rapid development of LNG infrastructure

Germany had no landing infrastructure for liquefied natural gas (LNG) until winter 2022. From 2022, as part of preventing a gas shortage, the federal government pushed forward the rapid construction of so-called floating LNG terminals in the winter of 2022/23, but also for the future. Firstly, it secured four Floating Storage Regasification Units (FSRUs) on which liquid natural gas can be re-converted to natural gas. Second, with an LNG Acceleration Act, it has created the legal preconditions to accelerate the construction of the necessary connections to land. For example, as of winter 2022/23, two FSRU vessels were able to enter into operation, feeding LNG into the German gas supply network. Two more FSRU sites will be operational by summer 2024. In addition, a private FSRU site has already been operating in the Baltic Sea since the beginning of 2023. Another FSRU is about to feed into the Baltic Sea. From 2027 onwards, three private land-based terminals in Brunsbüttel, Stade and Wilhelmshaven are planned to become operational gradually. The Federal FSRUs then cease operations at these sites.

Petroleum

Energy Security Act (EnSiG) – Oil

The scope of the Energy Security Act covers, inter alia, oil and petroleum products. Ordinances may regulate, inter alia, the production, transport, storage, distribution and purchase of energy sources, including mineral oil. In particular, provision may be made for any restrictive measures, such as speed limits or driving bans, up to a possible rationalisation of mineral oil supply. In the event of oil supply disruptions which cannot be absorbed by market participants alone or in the short term, the release of oil reserves under the Oil Stockholding Act is the first and priority means.

Measures such as speed limits and (partial) driving bans can be considered at most in the event of very severe and very long-lasting supply crises.

Oil Stockholding Act (petroleum BevG)

Since 1966 there has been a legal obligation in Germany to stock oil and petroleum products. It was introduced with the aim of securing energy supplies, at least against short-term disruptions in import flows, in the face of growing dependence on oil imports. Since then, the Oil Stockholding Act has been amended several times, not least on the basis of European requirements and international developments. The ÖlBevG comprehensively regulates the stockpiling of oil and petroleum products for crisis preparedness purposes. Subsequently, the Petroleum Stockholding Association (EBV) was set up as a direct federal body governed by public law with its registered office in Hamburg and was entrusted with stockpiling. It holds 90 days of net imports of crude oil, petrol, diesel, fuel oil EL and JET A-1. In the event of a supply crisis, the Federal Ministry of Economic Affairs and Climate Protection (BMWK) issues a release regulation to compensate for the loss of supply by stocks under the EBV.

Mineral Oil Data Act (MinÖlDatG)

The MinÖlDatG is the legal basis for collecting mineral oil data from all major companies trading mineral oil. The mineral oil data form the basis for regular monitoring of the German mineral oil supply, but also for crisis measures. The Federal Office for Economic Affairs and Export Control (BAFA) collects monthly mineral oil data on imports, exports, stocks and domestic sales of crude oil and petroleum products from the reporting companies. The data collected are used for national and international crisis preparedness, in particular to provide information on current developments in the German oil market.

Transport Services Act (VerkLG)

There may be a need for the requirement for transport capacity in the case of major oil supply crises where the Federal Government has identified a disruption of energy supply in accordance with the Energy Security Act, which cannot be remedied by market-based means, or cannot be remedied in a timely manner or only by disproportionate means. As the 'authorised authority' within the meaning of Section 7 of the Transport Performance Act, the BAFA must, in the event of a crisis, commission transport services for the BMWK's business area from the 'coordinating authority' (Federal Office for Goods Transport).

Fuel Supply Restriction Regulation (KraftstoffLBV)

The Fuel LabV regulates the possible rationing of fuels by means of reference certificates. This is based on the Energy Security Act and the Federal Government's statement that energy supply has been disrupted.

Fuel Oil Supply Restriction Regulation (HeizöllBV)

HeatingöllBV regulates a possible rationing of light fuel oil on the basis of a reference

quantity for a previous period. This is based on the Energy Security Act and the Federal Government's statement that energy supply has been disrupted.

Mineral Oil Compensation Regulation (MinöLAV)

The MinöLAV allows for a fair sharing of supply between over-served and underserved oil companies. As far as possible, market structures should be maintained and mineral oil sold at market prices. The Regulation may be applied mutatis mutandis in order to fulfil international obligations under the International Energy Programme of the International Energy Agency. The legal basis is the Energy Security Act and the Federal Government's statement that energy supply has been disrupted.

Mineral Oil Management Regulation (MinöLBewV)

The MinöLBewV regulates the possible rationing of motor and heating fuels and their production, distribution and use for the benefit of the population and the Federal Armed Forces and allied armed forces on the basis of the Economic Security Act (WiSiG) in the case of Article 80a GG. Again, the ultima-ratio principle applies.

National Emergency Strategy Organisation (Neso)

The National Emergency Strategy Organisation (Neso) was established as part of the IEA's International Energy Programme (IEP). The term Neso brings together the authorities, institutions and companies that are actively involved in their assessment, decision-making on response measures and their implementation in the event of oil crises. Neso is supported by close cooperation between public authorities and businesses, including their associations. The secretariat of Deutsche Neso coordinates the activities of the Neso stakeholders. It assists the Crisis Supply Council and the Supply Coordination Group in carrying out their tasks and liaises with the IEA alongside and in coordination with the BMWK. The Neso manual, a crisis management instruction, has just been reworked.

Electricity market

In Germany, a number of actors, as well as all electricity distribution companies, are responsible for supplying electricity to the public and carry out these tasks on their own responsibility. Before presenting the measures in the field of electricity, the key players were briefly mentioned:

Transmission System Operators (TSOs): Responsible for the operation, maintenance and, where appropriate, development of the networks used for the transport of electricity via a high-voltage and high-voltage interconnected network, including cross-border interconnectors (see Section 3(10) and No 32 of the Energy Industry Act – EnWG).

Distribution System Operators (DSOs) – Electricity: Carry out the task of distributing electricity, that is to say, the transport of electricity at high, medium or low voltage (see

Paragraph 3(3) and No 37 of the EnWG).

Balance responsible party (BKV) – electricity: The BKV is responsible for a balanced balance between injections and withdrawals in a balance area in every quarter-hour and assumes the economic responsibility for discrepancies between network users and transmission system operators as an interface between network users and transmission system operators.

Injections and withdrawals from a balance group (cf. § 4(2) StromNZV).

As electricity supply is only possible within secure and reliable grids, TSOs and DSOs have a central role to play. Under Paragraphs 13 and 14 of the EnWG, they must take appropriate measures to ensure the security and reliability of the electricity supply system. Network operators need to coordinate closely in fulfilling their supply obligations.

Measures to preserve and, where necessary, improve security of electricity supply in Germany

A functioning European internal electricity market with free pricing generally ensures the right investments in generation and flexibility in its own right. At the same time, the Federal Government's policies and measures to ensure the adequacy of resources and flexibility of the energy system create stronger incentives for market actors to secure their electricity supplies (see Chapter 3.4.3.ii.).

Nevertheless, markets are not always sufficiently prepared for very low probability events. In order to make the German and European electricity system more resilient to unpredictable developments and crises, Germany currently considers it essential to maintain reserves. This is particularly true in the context of the phase-out of nuclear and coal-fired electricity generation in Germany. The size of the reserves is regularly reviewed, for example in the context of the Federal Network Agency's security of supply monitoring, also in view of the systemic expansion of power plants under the Power Plant Safety Act and the creation of a capacity mechanism. Security of supply also needs to be ensured together in Europe.

In addition, the Federal Government is taking further measures to maintain and further improve security of electricity supply.

Power plant safety law (power strategy)

The Federal Government has also agreed on the strategy for the power plant as part of the growth initiative agreed together with the budget. In anticipation of the capacity mechanism, additional power plant capacity is to be rapidly deployed under a Power Plant Safety Act. The Power Plant Safety Act is implemented in two pillars.

The first pillar will be 5 GW of H₂-ready gas-fired power plants fully powered by hydrogen for decarbonisation as of the eighth year of deployment.

There are also 500 MW of hydrogen power plants running with hydrogen from the outset (so-called hydrogen printer power plants). This ensures that CO₂ emissions are reduced as quickly as possible and that the ramp-up of the hydrogen economy (power plant technology, hydrogen demand) is stimulated.

The aid is to be paid for 800 hours of full use per year. This is intended, on the one hand, to ensure refinancing over a sufficient number of eligible hours and, on the other hand, to limit the support costs to be expected under the measure as a whole.

In addition, 500 MW of long-term electricity storage will be put out to tender to support the development of technologies, convert electricity from a storage medium and feed it into the electricity grid for a longer period of time.

As a second pillar, 5 GW of new taxable services will be put out to tender for security of supply with high investment amounts and long refinancing periods.

All power plants put out to tender early will be integrated into the new capacity-mechanism in an appropriate manner from 2028, excluding double funding. The calls for tenders ensure that power plants are built on sites useful to the system. The capacity mechanism is designed to be technology-open, e.g. to include storage and loads.

Operation of energy supply networks

Pursuant to Section 11 EnWG, operators of energy supply networks are obliged to operate, maintain and optimise, strengthen and develop a secure, reliable and efficient energy supply network on a non-discriminatory basis, in so far as it is economically reasonable.

As a result of the fundamental transformation of the electricity system towards 100 % renewable energy production and sector coupling technologies (e-mobility, heat, hydrogen), the Federal Government together with the sector developed a 'Roadmap System Stability' and adopted it at the end of 2023. The roadmap includes a roadmap for secure and robust grid operation with 100 % renewable energies. It identified the need for action and clearly identified processes and responsibilities to address these needs. The necessary measures will also be implemented with the industry and will be located in one place. As a building block for this, the transmission system operators will in future regularly draw up a system rating report containing the necessary measures and needs and options for action towards stable electricity grid operation with 100 % renewable energy. The Federal Network Agency will monitor implementation.

Provision of information

Pursuant to Section 12(2) EnWG, transmission system operators must provide operators of another system with which their own transmission systems are technically connected with the necessary information to ensure safe and efficient operation, coordinated development and interconnection.

Network Reserve

In accordance with Section 13d of the EnWG, TSOs shall hold installations for the purpose of ensuring the safety and reliability of the electricity supply system, in particular for the management of grid congestion and for voltage stability and for the security of possible supply restoration (gridreserve). The network reserve has a size of 4.6 GW in winter 2023-2024.

Capacity Reserve

The Capacity Reserve serves to further safeguard the electricity market and is regulated in Section 13e EnWG and the Capacity Reserve Regulation. It is held outside the electricity markets and is designed in such a way as not to distort, as far as possible, incentives to invest and the competitive situation in the electricity markets. For example, generation facilities will be banned from returning to the electricity and balancing markets once they have been locked into the capacity reserve. In order for an installation to participate in the Capacity Reserve, it must fulfil certain conditions relating to its location and technical characteristics. Among other things, an installation must be connected to the German grid and meet certain flexibility requirements. The procurement of capacities shall be carried out in a transparent, competitive and non-discriminatory manner. The reserve power to be procured (max. 2 GW) shall be tendered every two years and the TSOs shall add the admissible bids according to the bid value in ascending order. The capacity reserve facilities shall be activated by the TSOs if the demand in the electricity market is not expected to be fully met by the supply. The retrieval is then carried out in the event that the safe and reliable operation of the German transmission system is at risk and all system-side measures (e.g. Network interconnections) and all market-related measures (e.g. Use of balancing energy). The uncovered balances responsible for a call will contribute to the costs of the capacity reserve by paying an increased imbalance price (currently at least around EUR 20/MW) during the call. The Capacity Reserve has not yet been used.

Regular monitoring of the security of supply of electricity

Under Paragraph 63(2) of the EnWG, the Federal Network Agency is to draw up a monitoring report at least every two years on the state and development of security of supply in the electricity sector. This report aims to ensure that security of supply is closely monitored and, if necessary, sufficient time for possible measures to ensure security of supply.

The last report on monitoring the security of supply of electricity was published in February 2023 and shows that the current plans of the Federal Government for the period 2025-2031 (even if coal phased out in 2030) continue to ensure a high level of electricity supply. In the short term, the Federal Government will also consider security analysis scenarios with conservative and crisis-related scenarios that reflect critical situations and also uncertain developments in the mid-term from 2030 (e.g. delayed grid expansion,

fewer renewable energies, fewer taxable loads).

The reliability standard is not exceeded in any of the scenarios and sensitivities analysed in the monitoring. To this end, a number of production and network developments need to be carried out and efforts continued. These include, for example, the construction of new power plants, the lifting of flexibility potential or the implementation of cross-border redispatching. Security of supply to consumers applies both in terms of sufficient generation capacity and sufficient network capacity: The results from the market side show that demand can be met at any time in all hours of the year in the period up to 2030/31. The network-side studies show that, if the current targets of network expansion are respected and the potential available for congestion management is exploited, it is possible to ensure that network operation is tight.

The Federal Network Agency has based its analysis on the Federal Government's ongoing plans for the transformation of the electricity system. These include: Renewable energy will be developed in line with the objectives of the Renewable Energy Act and the amended Wind-on-See Act – by 2030, the generation capacity of onshore wind, offshore wind and photovoltaics will be increased to 360 GW. According to the network development plan, the transmission and distribution networks will be upgraded.

On the basis of the report, the Federal Government has developed and adopted measures to ensure the security of supply analysed in the report. These include, but are not limited to:

- increasing the development of renewable energies;
- Activate potential for local incentives and flexibility;
- accelerated planning and permit-granting procedures for network deployment;
or
- Further development of reserve instruments

The rules and measures mentioned above for the gas sector in the event of a disruption of gas supply apply very similarly to the electricity sector. First, under Section 13 EnWG, TSOs are entitled to take network and market-related measures and to use the network and capacity reserve to eliminate threats or disruptions to the electricity supply system. As a next step, if these instruments are insufficient, TSOs shall have the right and obligation to adapt all electricity inputs, transits and collections. If this is not sufficient, and there is a risk of imminent danger or disruption of energy supply, which threatens to meet vital energy needs, the instruments of the Energy Security Act and accompanying regulations apply:

Energy Security Act (EnSiG)

The Energy Security Act (EnSiG) contains provisions to prevent an energy crisis and in

the event of an imminent or acute energy crisis. It aims to prevent or remedy supply disruptions, take remedial action and secure vital energy needs. It covers oil and petroleum products, other solid, liquid and gaseous energy sources, electrical energy and other energy (goods). The EnSiG is characterised by its comprehensive enabling framework. This concerns, inter alia, the authorisation both to provide for certain measures to avoid an immediate threat or disruption to energy supply and to take necessary measures to safeguard vital energy needs in the event of imminent danger or disruption. On the basis of the EnSiG, for electricity, inter alia, the Regulation on safeguarding electricity supply is in a

Supply crisis (Electricity Guarantee Ordinance – EltSV).

Regulation on safeguarding electricity supply in a supply crisis (Electricity Protection Ordinance – EltSV)

On the basis of the EnSiG, the Electricity Protection Ordinance (EltSV) empowers the electricity distributor to take measures at all stages of the energy value chain. It may, for example, issue orders to businesses and consumers on the allocation, purchase and use of electrical energy. The EltSV is in force, but will not be applied until a further legal provision establishes that there is a risk or disruption of the energy supply within the meaning of the EnSiG and the EltSV applies.

Ordinance on safeguarding electricity supply (Electricity Load Distribution Regulation – EltLastV) and General Administrative Regulation on the Electricity Load Distribution Regulation (EltLastVwV)

In the case of voltage and defence, special arrangements shall be applied to remedy or mitigate the consequences of a power supply disruption. If the Bundestag has identified the tension or defence case or has specifically approved such a measure, the Federal Government may regulate electricity supply for defence purposes by means of a regulation on the basis of the Economic Security Act (WiSiG). On the basis of the WiSiG, the Electricity Load Distribution Regulation (EltLastV) was adopted. The aim of the EltLastV is to maintain electricity supply in a voltage or defence case by means of state management measures. In accordance with the General Administrative Regulation on the Electricity Load Distribution Regulation (EltLastVwV), it covers the entire production, distribution and use of electricity. Similarly to the EltSV, the EltLastV cannot easily be used. The application of the EltLastV is subject to a further statutory ordinance establishing its applicability. Like the EltLastV, the EltSV authorises the load distributor to take measures at all stages of the energy value chain.

Measures in the event of energy shortages

Transmission system operators shall be responsible for the security and reliability of the electricity supply system. If the relevant measures under Section 13(2) EnWG are found to be insufficient to avert a supply disruption for vital needs within the meaning of Section 1 EnSiG, the transmission system operator must immediately inform the

regulatory authority, i.e. the Federal Network Agency. If the energy supply to meet vital energy needs is directly endangered or disrupted and the threat or disruption of energy supply cannot be remedied by market-based measures, or cannot be remedied in a timely manner or only by disproportionate means, the EnSiG's powers apply.

3.3.ii. Regional cooperation in this area

Gas

Risk groups

With the entry into force of Regulation (EU) 2017/1938 concerning measures to safeguard the security of gas supply, a regional chapter should be added to the national preventive action plans and emergency plans. These chapters are jointly developed by the EU Member States in so-called risk groups. Germany has taken over the chairmanship of the Baltic Sea Risk Group and participates in a further six risk groups (Ukraine, Belarus, North East, L-gas, Denmark and North Sea (composed of the former risk groups Norway and UK)).

Consultations on Preventive Action Plan and Emergency Plan

As part of the crisis preparedness under Regulation (EU) 2017/1938, in addition to the national risk analyses, the above-mentioned national preventive action plan and the national emergency plan for crisis preparedness are drawn up. In Germany, these plans are consulted with the departments of the Federal Government, the competent authorities of the 16 German Länder, as well as with professional and interbranch organisations. At European level, in accordance with Article 8(6) of Regulation (EU) 2017/1938, the competent authorities

consult the authorities of all nine EU Member States directly linked to Switzerland. In addition, consultations are taking place with a further 15 EU Member States of the risk groups in which Germany is part, as well as with Switzerland and the United Kingdom.

Mechanisms for cooperation in the event of a crisis

In principle, the European Commission is responsible for coordinating the flow of information between Member States at all three crisis levels. The BMWK is the central point of contact for the Member States connected to gas infrastructure, the EU Commission and beyond, and ensures the flow of relevant information.

As congestion situations can be very diverse and require responses based on comprehensive information, the fundamental and main concern of the risk groups is to ensure the flow of information between Member States and relevant stakeholders of the risk group in a crisis situation. The cooperation mechanism within the risk group shall be subject to the coordination procedures between Member States, transmission system operators, regulatory authorities and other information holders at the different crisis

levels. The aim is to provide the relevant stakeholders with detailed information on the causes and effects of a crisis situation and to coordinate potential mutually agreed solutions to prevent or mitigate the negative effects of a supply crisis.

In general, transmission system operators cooperate closely with TSOs of the other Member States of the group, in particular in the framework of the Regional Coordination System for Gas (ReCo), established by the Association of Europeans.

Transmission system operators (ENTSO-G) pursuant to Article 3(6) of Regulation (EU) 2017/1938. At Member State level, this exchange takes place in the context of the Gas Coordination Group (GCG) pursuant to Article 4 of Regulation (EU) 2017/1938. If a shortage of supply is foreseeable, TSOs shall contact TSOs in the other Member States belonging to the risk group. To the extent possible, they shall agree on the cross-border coordination of actions, including the exchange of information on the need for:

market-based measures with cross-border effects.

The ReCo team is activated by the 24-hour intervention teams of transmission system operators and ENTSG. After the meetings, ENTSG informs the European Union Agency for the Cooperation of Energy Regulators (ACER) and the EU Commission.

Where the declaration of the emergency level has been necessary and has subsequently been made, the load distributors of the Member States belonging to the risk groups are in close contact with each other, in particular information on the expected level of necessary cross-border load flow restrictions.

Solidarity between Member States in an acute shortage situation

In accordance with Article 13 of Regulation (EU) 2017/1938, Germany is obliged to make gas available to infrastructural neighbouring EU countries, including Italy, on a market-based and non-market-based basis 'solidarity' in a severe gas shortage situation. At the same time, these Member States are also bound by Germany.

In the unlikely event of a gas shortage and the associated performance of tasks in relation to the European obligations pursuant to Section 2a(2) EnSiG, the Federal Government will provide the market area responsible for gas with the necessary financial resources under budgetary law, possibly also in the short term under the emergency authorisation right under Section 37 BHO. The Federal Government is aware that THE cannot enter into legal transactions within the meaning of Section 2a(2) EnSiG before these funds are made available, provided that they trigger a payment obligation.

The obligation to provide solidarity applies irrespective of a fundamentally financial procedural and technical understanding in bilateral solidarity agreements. To date (as of August 2023), Germany has had Denmark (14th December 2020) and Austria (01. December 2021)

Solidarity agreements concluded in accordance with Article 13 of Regulation (EU)

2017/1938.

Germany has prepared and implemented all processes to enable its infrastructural neighbours, including Italy, to request and deal adequately with gas solidarity in a severe gas shortage. All EU neighbouring countries connected to Germany, including Italy, have been informed of how the application of the principle of solidarity under Article 13 of Regulation (EU) 2017/1938 will be implemented by Germany or how Germany will fulfil its solidarity obligations under Article 13 of Regulation (EU) 2017/1938 towards those EU Member States. In addition, Germany has asked its neighbouring countries, including Italy, to communicate in turn the technical conditions that Germany has to fulfil in order for Germany to be able to request gas solidarity from its neighbouring countries, including Italy.

Petroleum

Germany's oil crisis preparedness is internationally embedded both within the European Union (EU) and supranationally within the International Energy Agency (IEA). IEA sections are the Standing Group on Emergency Questions (SEQ) and the EU the Oil Coordination Group (OCG). There is a continuous exchange of information between national experts at regular intervals, which will enable international coordinated crisis prevention measures to be carried out at an early stage in the event of an emergency. On the basis of the joint work, a detailed mineral oil data system has been set up. The respective oil stocks organisations are involved in the work of the relevant EU and IEA working groups.

Annual Coordinating Meeting Entities Stockholding (ACOMES)

The ACOMES organises oil stocks. They exchange yearly on specific, technical topics and new developments.

Electricity

In future, in addition to national structures, regional structures will become increasingly important in the context of crisis preparedness. In line with the Regulation on risk-preparedness in the electricity sector, which entered into force on 4 July 2019, provisions are to be introduced at European level to support EU Member States among themselves to ensure security of electricity supply together even in extreme situations (see Chapter 2.3.i.).

Cross-border consideration of security of supply in the electricity market

Security of supply in the electricity market needs to be considered across borders as the individual electricity markets are strongly interlinked. A purely country-specific approach would misassess the actual level of security of supply. The assessment of security of supply should be based on probabilities. The Federal Government builds its analyses on the security of supply of electricity on such probability-based approaches

and continuously develops the underlying methodologies. The desired level of ambition will be set in order to assess the actual security of supply and to identify any necessary measures. In addition, the Federal Government is exploring adapted approaches to identifying and assessing specific crisis scenarios which might require the use of strategic reserves for risk preparedness and management.

Pentalateral Energy Forum – Security of electricity supply

On security of electricity supply, the TSOs of the Penta States have regularly published a joint regional security of supply report since 2015. This builds on the same methodology as the national report (see above) and the European Mid-Term Adequacy Forecast. Member States also held a first joint crisis exercise in 2018 with the participation of transmission system operators, regulatory authorities and ministries in the region. The aim of this exercise was to ensure closer cooperation between Member States within the meaning of the Regulation on the

Prepare risk-preparedness in the electricity sector. See also Chapter 3.4.

3.3.111. Where applicable, financing measures in this area at national level, including Union support and the use of Union funds

Electricity networks, together with reserves such as capacity and network reserve or security readiness, make a significant contribution to the security of energy supply. Electricity grids and reserves are financed through network charges.

In the gas sector, security of supply is ensured by modern and well-developed transmission networks (see chapter 2.4.2.)

3.4. Dimension Internal energy market

3.4.1. Electricity infrastructure

3.4.1.1. Policies and measures to achieve the targeted level of interconnectivity as set out in point (d) of Article 4

Electricity Network Development Plan (NEP)

Pursuant to Section 12b EnWG, transmission system operators are required to submit a joint NEP every two years. They shall identify all measures necessary for secure and reliable system operation. The network development plan considers both medium-term developments (the next 10-15 years) and long-term scenarios that look into 2045. The underlying assumptions are set out in the scenario framework pursuant to Section 12a EnWG. This includes assumptions for new electricity exchanges with other countries. On this basis, the NEP also examines the construction of new interconnectors. A cost-benefit analysis shall be carried out, as provided for in Article 4(d)(1) of the Governance

Regulation. This will also ensure that interconnectors with neighbouring countries with large price differences tend to perform better.

The NEP is reviewed and confirmed by the Federal Network Agency. The network development measures can then be included in the Federal Needs Plan Act and thus become legally binding.

Interconnectors included in the Energy Pipeline Development Act (EnLAG) and the Federal Needs Plan Act (BBPIG)

The Federal Needs Plan Act was last amended in 2022 on the basis of the NEP 2021-2035. The current Federal Requirements Plan Act therefore already contains many interconnectors which contribute to the achievement of the electricity interconnection target. The following tables show all the interconnectors included in the Energy Line Development Act and the Federal Requirements Plan Act.

Table A4: Existing Interconnectors:

Projects EnLAG/BBPIG	No. after	TYNDP No	Commissioning	Europ. Statuses
De-NL (Niederrhein/Wheel – NL Doetinchen)	EnLAG No 13	113/145	2018	
De-PL (Uckermark line, section four-rades – Krajnik)*	EnLAG No 3		2018	
De-DK (Central Axis; Kassø – Hamburg Nord – Dollern)	EnLAG No 1	39, 251	IN 2020	
De-DK (Kriegers Flak Combined Grid Solution, P64)	BBPIG No 29	36/141	IN 2020	
De-BE (ALEGrO Oberzier – border BE, P65)	BBPIG No 30	92	IN 2020	
De-NO (NordLink, Wilster – South Norway)	BBPIG No 33	37	IN 2021	
De-DK (West coast pipe Niebüll – DK border, P25)	BBPIG No 8	183	2023 (DE operational)	

*Total entry into service in 2024 (Neuenhagen – Bertikow/Vierraden – Krajnik)

Table A5: Other Interconnectors with scheduled commissioning by 2030:

Projects EnLAG/BBPIG	No. after	TYNDP No	Target date according to Act.	Europ. Statu
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De-SE (HansaPowerBridge, Güstrow – Sweden)	BBPIG No 69	176.995	2026 (currently postponed by SE)	
De-GB (New Connect, Fedderwarden – United Kingdom)	BBPIG No 70	309	2026 (current: 2028)	
De-FR (Eichstetten – Federal border FR)	BBPIG No 72	228	2026 (current: 2027)	
De-LU (Landkreis Trier-Saarburg – Bofferdange)	BBPIG No 71	328	2027	
De-AT (Altheim – Federal border AT, Pleinting – Federal border AT, Simbach – Federal border AT)	BBPIG No 32	313	2027/2030	PCI 3.1.1
De-FR (Uchtelflight – Ens Dorf – Federal border)	BBPIG No 97	244	2030 (current: 2028)	
De-AT (point Neuravensburg – Federal border at AT)	BBPIG No 40	3.221.477	2030	

Table A6: Other interconnectors with scheduled start-up after 2030:

EnLAG/BBPIG project	No. after	TYNDP No	Target date according to Act. BNetzA Monitoring	Europ. Statuses
De-NL (Emden East – Eemshaven)	BBPIG No 86	1047	2034	
De-BE (steel – federal border)	BBPIG No 95	225	2035	
De-CH (Waldshut-Tiengen – Federal border)	BBPIG No 99	231	open	
De-PL (Ferrous smelter – Baczyna)	EnLAG No 12	229/230	open (postponed by PL)	
De-SE (HansaPowerBridge II, Sanitz/Gnewitz/Dettmannsdorf/Marlow – Sweden)	BBPIG No 83	2.671.262	open (postponed by SE)	

The completed NEP 2023-2037/2045 looks for the first time into 2045 and thus represents an even higher level of ambition. Accordingly, additional network expansion measures were confirmed by the Bundesnetzagentur, which further increase the level of interconnectivity. These measures will also be included in the BBPIG.

3.4.1.11. Regional cooperation in this area

Regional cooperation projects and cooperation extend beyond the field of electricity infrastructure and are grouped together for Chapter 3.4 on the internal energy market dimension in Chapter 3.4.2.ii.

3.4.1.111. Where applicable, financing measures in this area at national level,

including Union support and the use of Union funds

The financing measures at national and Union level are summarised in chapter 3.4.2.iii.

3.4.2. Energy transmission infrastructure

3.4.2.1. Policies and measures related to the elements set out in point 2.4.2, including, where applicable, specific measures to enable the delivery of Projects of Common Interest (PCIs) and other key infrastructure projects

Monitoring and controlling electricity grid expansion projects

Since the beginning of 2016, the Federal Network Agency has produced and published quarterly monitoring of the individual EnLAG and BBPIG projects and the connection lines of wind farms at sea (www.netzausbau.de). This will allow the public to be informed at any time about the progress of network deployment. Since 2019, BMWK Network Development Controlling has been in place for onshore projects. It complements the existing network expansion monitoring at the Federal Network Agency. In 2020, BMWK controlling was extended to offshore projects. As part of the network extensioncontrolling, the project promoters and competent licensing authorities inform the BMWK on a quarterly basis about the state of play and the planning of the individual projects. In addition, in particular for the HVDC projects, individual discussions are held, supplemented by regular, ad hoc discussions on the other federal, regional and offshore projects.

Faster deployment of electricity grids

Many legal and non-statutory measures have been taken in recent years to accelerate the roll-out of electricity grids.

Adjustments to the legal framework in the context of the emergency energy package

As part of the immediate energy measures package, in 2022 the possibility of renouncing specialised federal planning by means of a greater concentration of projects and the development of so-called 'preferential areas' was expanded. The greater bundling also reduced the number of alternatives to be tested. In addition, the application documents have been simplified in federal planning; the application conference in the federal planning can now be dispensed with. The requirement for local authorities to check overhead lines for direct current underground power projects has been abolished and the electronic interpretation of documents in procedures under the NABEG has been maintained. Acquiescence orders during preparatory work and their enforceability, as well as the approval and enforceability of the early start of construction, have been simplified.

Adjustments to the legal framework under the Energy Security Act

Further measures have been taken to accelerate grid expansion through the Act amending the Energy Security Act and other energy regulations. In particular, the approval of the early start

of construction has been further improved, the notification procedure for relaying, fastening and site-based changes in the fattening area has been extended, and the planning approval for ancillary installations in isolation has been made possible; Dates for discussion are now at the discretion of the Authority.

EU Emergency Regulation Authorisation

The EU Emergency Regulation further speeds up the procedures for developing electricity grids, in particular with the implementing rules for Article 6. With transposition into German law as part of the amendment of the Spatial Planning Act and other provisions, an environmental impact assessment and an assessment under species protection law may be waived for a limited period if the

Network development projects are set up in areas for which a Strategic Environmental Assessment has been carried out.

Adaptation of the legal framework under the Act on the adaptation of energy management law to EU law and amending other energy legislation

The Act, which entered into force at the end of 2023, adapts energy industry law to EU law and amends other energy legislation (the EnWG amendment) contains further provisions to speed up network expansion: The requirement for bundling will be strengthened and the previous two-stage planning approval procedure of the NABEG, such as the EnWG procedure, is to be singled out in future. It also provides for more efficient implementation of public participation and increased digitalisation, as well as facilitation of implementation during the complement to the plan. Finally, it facilitates the approval of so-called 'provisoris', i.e. temporary high-voltage power lines, which are constructed, for example, during the construction phase of a permanent high-voltage line, in order to maintain stable network operation during that period. An obligation to tolerate landowners to facilitate the transport of key network elements has also been implemented, as well as a regulation to make alternative paths more efficient.

Legislative changes outlook

The draft transposition of RED III into national law is currently under parliamentary procedure.

Exchange of best practices

A [practical guide to network development was](#) developed on behalf of the BMWK and published in October 2021. It contains more than 100 practical recommendations for action. The aim of the guide is to provide permitting authorities and project promoters with best practice examples for speeding up and optimising network deployment. Recommendations on project management, resource management, public participation, licensing and project realisation.

In addition, the BMWK already invited four best practice forums to present the findings

gathered in the Practical Guide and to discuss in depth selected topics. The

In particular, best practice forums should also enable experience to be exchanged and knowledge transfer at technical level between the competent licensing authorities, the Federal Network Agency and the project promoters. Both aims to make the authorisation and implementation of network development projects more efficient.

Reduction of the scope and depth of the test

In addition, the BMWK, the Federal Network Agency and the transmission system operators are in close dialogue with a view to reducing the scope and depth of the audit in the approval process, while respecting the legal requirements, thereby reducing the length of the procedure. In doing so, the objectives of a network as fast as possible, economically and linearly should be better taken into account in the planning and approval process.

Optimisation and modernisation of the stock network

Network operators are obliged to operate, optimise, strengthen and develop the electricity grid according to their needs. From the so-called NOVA principle, optimisation prevails over grid reinforcement and expansion. In order to optimise existing networks, a number of measures are planned to increase the transmission capacity of existing electricity networks. This includes, inter alia, the comprehensive roll-out of overhead line monitoring (temperature measurement allows for higher transmission capacity of the lines depending on the weather); Wrapping of high-temperature conductor cables; short-term intermediate measures (in particular phase shifters for targeted loadflow management, temporary height load); the optimisation of redispatching processes and the introduction/further development of modern, digital technologies and systems management concepts. In 2023, in the process of the Network optimisation action plan, a large number of ad hoc measures to ensure that the network infrastructure is consistently loaded and optimised were identified, some of which have already been implemented or the legal and regulatory bases.

Secure power grid operation with 100 % renewable energies

Stable grid operation is essential for the further success of the energy transition towards a climate-neutral electricity system, alongside the rapid expansion of renewables and electricity grids. The Federal Government, together with the industry, therefore drew up a 'Roadmap for System Stability' and adopted it at the end of 2023. The roadmap includes a roadmap for secure and robust grid operation with 100 % renewable energy. It identified the need for action and clearly identified processes and responsibilities to address these needs. The necessary measures will also be implemented with the industry and will be located in one place. As a building block for this, the transmission system operators will in future regularly draw up a system stability report containing the necessary measures and needs and options for action towards stable electricity grid operation with 100 % renewable energy. The Federal Network Agency will monitor implementation.

Network Development Plan (NEP) – Gas and Hydrogen

Under Section 15a of the EnWG, TSOs are obliged to jointly draw up the NEP on a biennial basis. This must include all effective measures to optimise, reinforce and develop the network according to needs and to ensure security of supply over the next ten years, which are necessary for the safe and reliable operation of the network. DSOs provide the necessary information for this purpose, cf. Section 15a(4) EnWG. In accordance with the fourth sentence of Section 15a(1) EnWG, the preparation of the NEP Gas also includes assumptions about possible disruptions to security of supply. After assessment by BNetzA, this plan will become binding on TSOs.

In the draft Gas Network Development Plan 2022-2032 of 31 March 2023, the network development proposal includes a total of 140 measures with an investment volume of approximately EUR 4.4 billion. A total of 82 new measures have been added compared to the gas grid development plan 2020-2030. The additional measures proposed compared to the previous network development plan are largely linked to the changed flow situation in the transmission network due to the disappearance of Russian natural gas. Against this background, and in order to ensure security of supply in the long term, network development measures play a role in:

future transport of LNG volumes is crucial. In addition, further expansion is needed for future gas-fired power plants and for the conversion of low calorific gas to gas with high calorific value.

As part of the legal regime for the second stage of accelerated hydrogen grid roll-out, network development planning for gas and hydrogen will be integrated in the future. The parliamentary process for this legislative amendment was completed in spring 2024. As part of this future rolling network development planning for gas and hydrogen, a draft scenario framework for a network development plan, including assumptions on the development of production, supply and consumption of gas and hydrogen, will be presented on 30 June 2024. Building on this, the first integrated network development plan for gas and hydrogen will be prepared and confirmed by the regulatory authority by 30 June 2026. As part of this recurrent planning process, there is in principle the possibility of a needs- and scenario-oriented adaptation of the dimensioning of the hydrogen network, for example on the basis of updated forecasts of needs of different regions.

Monitoring of gas network expansion projects

With regard to the development of gas transmission infrastructure, Section 15b EnWG requires transmission system operators to draw up an implementation report in each odd calendar year and for the first time by 1 April 2017. This report shall include information on the state of implementation of the most recently published NEP and, in case of delays in the implementation of individual projects included in the NEP, the relevant reasons and possible impacts, e.g. in terms of capacity provision. BNetzA shall examine and publish the implementation report and give all actual and potential network users the opportunity to comment. The results of this consultation will also be published by BNetzA and may feed into guidance for the next NEP process or other regulatory processes.

3.4.2.11. Regional cooperation in this area

Pentalateral Energy Forum – Internal Energy Market

The objective of the Pentalateral Energy Forum is to achieve closer coupling of the participating States' electricity markets, test and implement new forms of cooperation and thus gain experience in cross-border cooperation. Germany participates in the preparation of the regional security of supply report (see also Chapter 3.3.i.).

Electricity Neighbours

This cooperation covers all the neighbouring countries of the Federal Republic of Germany, as well as Norway and Sweden. It has been in place since 2014 and focuses on increasing the flexibility of electricity markets. It also serves to inform electricity neighbours about developments in Germany and to include them in the national debate on the energy transition.

Cooperation in regional groups in the framework of Transeuropean Networks Energy (TEN-E regional groups) – Internal electricity market

In the area of electricity infrastructure, there are four priority areas within the TEN-E regional groups.

Energy infrastructure corridors in which Germany is listed as a Member State concerned and thus a member of the relevant regional group. These include North Seas offshore grid (NSOG), North-south electricity interconnections in western Europe (NSI West Electricity), North-south electricity interconnections in central eastern and south eastern Europe (NSI East Electricity) and Baltic Energy Market Interconnection Plan in electricity (BEMIP Electricity, distinct from the BEMIP Cooperation Forum in Chapter 1.4.).

3.4.2.111. Where applicable, financing measures in this area at national level, including Union support and the use of Union funds

Investments in the expansion, reinforcement and optimisation of transmission networks are not only important for Germany's energy transition. They are also key to advancing the European single market. The refinancing of these costs is regulated by the incentive regulation and the Electricity Network Charges Regulation. Under the investment measure instrument, there is a separate refinancing instrument for major expansion and restructuring investments in the transmission system. Certain PCI projects may apply for financial support from the Connecting Europe Facility (CEF) for construction projects and preparatory studies. In the past, the German electricity grid projects 'SuedLink' and 'SuedOstLink' have received CEF funding.

3.4.3. Market integration

3.4.3.1. Policies and measures related to the elements set out in point 2.4.3

Market integration measures

Gradual reduction and closure of coal-fired electricity generation on the basis of the KVBG (by 2038 at the latest) and the Act on the acceleration of lignite phase-out in the Rhineland district

A gradual reduction and closure of coal-fired electricity generation in Germany is planned. To this end, the 'Law to reduce and end coal-fired electricity generation and to amend other laws' (the Coal Exit Act) entered into force in August 2020. The 'coal phase-out law' implements the Commission's energy policy recommendations on growth, structural change and employment. It contains, inter alia, rules for the reduction and termination of coal and lignite-fired electricity generation by 2038 at the latest, the continuous verification of security of supply, the cancellation of released CO₂allowances and an adjustment allowance for older workers in the coal sector.

The essential part of the coal phase-out act (Mantelgesetz) is the Coal Electricity Generation Termination Act (KVBG), which regulates the gradual reduction of coal-fired electricity generation with fixed targets for 2022 (15 GW coal, lignite each), 2030 (8 GW coal, 9 GW lignite) and 2038 (0 GW). The reduction of coal-fired electricity generation takes place first by means of calls for tenders and then by means of legal requirements. Lignite-fired electricity generation will be reduced by 2038 by means of a legally binding decommissioning pathway for lignite-fired power plants.

The law on speeding up lignite phase-out in the Rhineland district accelerated the lignite phase-out in the Rhineland by around 8 years and brought it forward from 2038 to 2030. The law speeding up the Lignite phase-out in the Rhinelands entered into force in December 2022.

Sector coupling

Sector coupling, i.e. efficient, direct and indirect use of renewable electricity, will be promoted to replace fossil fuels in heating, industry and transport. The coupling or electrification of the sectors leads to a sharp increase in electricity demand in Germany (cf. Chapter 2.3.i).

Therefore, in addition to a sufficient supply of RES-E, stable and well-developed transmission and distribution networks are an important prerequisite for successful sector coupling. It will also create a level playing field, leaving it to the market to determine which technologies will ultimately prevail and thus be used. It stimulates innovation and brings modern technologies to the market.

Ideally, efficient sector coupling and thus CO₂reduction would be mainly market-driven and without lock-in effects via price signals. In order for sector coupling to make a significant contribution to achieving climate neutrality by 2045, in addition to the necessary transmission capacity for electricity at transmission and distribution system level, generation capacity needs to be further developed at high speed.

Action plan to reduce grid congestion

On the basis of Article 15 of the European Electricity Market Regulation, Germany submitted on 28 The "Bidding Zone Action Plan" was presented on December 2019 to address structural network congestions. This plan sets out the planned linear increase in the minimum remaining

Available Margin (minRAM) capacity available for cross-bidding electricity trading to 70 per cent by 31. December 2025. For 2023, the applicable minimum value in the CORE region (see Section 3.4.3.i) was 40.8 %. The concerned Transmission System Operators (TSOs) are required to carry out an annual review of compliance with the minRAM requirements.

The TSOs' implementing report confirms that the requirements were complied with in 2023. Failure to comply with the minimum values was necessary in a few hours to ensure system security and is therefore in line with the Electricity Market Regulation.

In addition, the Action Plan defines national measures to accelerate grid expansion (e.g. through shortened permitting procedures), increase electricity transmission capacity (e.g. through weather-dependent overhead line operation), improve congestion management (e.g. by optimising the integration of RES and CHP plants in redispatching) and strengthen cross-border redispatching. Germany is also keen to intensify existing cooperation with neighbouring countries and to initiate further cooperation projects.

Cross-border actions in the action plan to reduce grid congestion

Many measures that have a positive effect on grid bottlenecks can only be implemented jointly with neighbouring countries, for example because they require joint coordinated action. An example of this is an optimisation of cross-border redispatches, which can only be done together with neighbours. Recent studies by Consentec and IFHT show that optimising cross-border redispatching can greatly reduce redispatching costs for the whole region and help meet European electricity trading requirements. There are grid bottlenecks within Europe's electricity grids, which cannot be effectively solved by purely national measures. This is why Germany is already cooperating with many neighbouring countries on redispatching. These mostly bilateral co-operations will be complemented by further cooperation. In the medium term, cross-border redispatching will be optimised throughout the region. For this purpose, TSOs are currently developing a methodology, which will then be approved by the national regulatory authorities. In order to bridge the gap, existing redispatching co-operations will be continued and, where possible, extended.

Measures to improve market coupling

Creation of a Central and Eastern Europe Capacity Calculation Region (CORE)

Following a decision of the Agency for the Cooperation of Energy Regulators (ACER) of November 2016, a single central and eastern European capacity calculation region was created by the live screen of the Core region on 8 June 2022. This includes a total of 13 countries: Austria, Belgium, Croatia, Czechia, France, Germany, Hungary, Luxembourg Netherlands, Poland, Romania, Slovakia and Slovenia. The applied flow-based market coupling (BMC), where a day-ahead algorithm and a well-performing capacity distribution model performs, allows for the use of scarce transmission capacity between bidding zones in a much more efficient way. This also strengthens the integration of renewables into the internal electricity market. In the next step, the introduction of flow-based market coupling is also

envisaged for intra-day electricity trading.

Coupling intra-day electricity trading

In addition to the cross-border day-ahead market, the importance of intraday cross-border trade is also growing. Two parallel processes to optimise within-day trading capacities support this process: on the one hand, the so-called XBID (Cross-Border Intra-Day) project, which since June 2018 connects intraday markets in northern, western and southern Europe, initially on the basis of conventional capacity allocation. Work is also underway to extend this market coupling towards Eastern Europe. On the other hand, the extension of flow-based market coupling to intraday trading. Both measures help cross-border electricity markets to exchange flexibilities in the short term, i.e. just before real-time, in order to jointly respond to short-term changes in generation and demand.

System development strategy

Efficient energy infrastructure requires coordinated planning in the different sectors (electricity, gas and hydrogen in the future). In this context, the BMWK draws up a system development strategy which addresses key issues relating to the decarbonisation of all sectors and thus develops an overarching picture of the requirements to be met in the future for the different energy infrastructures. For the purposes of infrastructure planning, the system development strategy can set such guidance as to guide all processes. This will ensure efficient and consistent planning in the areas of electricity, gas and hydrogen.

3.4.3.11. Measures to increase the flexibility of the energy system with regard to renewable energy production such as smart grids, aggregation, demand response, storage, distributed generation, mechanisms for dispatching, re-dispatching and curtailment, real-time price signals, including the roll-out of intraday market coupling and cross-border balancing markets

Further integrate and make European electricity markets more flexible

A European electricity system helps respond to both increasingly flexible generation and fluctuating consumption, thus reducing the total cost of electricity production and the need for capacity. One step that will further integrate European electricity markets is the planned implementation of flow-based market coupling in the intraday market within the CORE region (details on flow-based market coupling and CORE region are presented in section 3.4.3.i). In addition, the Network Code 'Capacity Allocation and Congestion Management' (NC CACM) establishes a methodology for coordinated cross-border redispatching. Two new NCs are currently in the design phase. The NC Cybersecurity aims to define a European harmonised standard for cyber security across borders. The NC Demand Response aims to shape the participation of flexibility providers in European electricity markets.

Redispatch optimisation measures

For an increasing share of renewable energy in electricity generation and for progressive sector coupling, the question of how to organise the interaction between the electricity market and the electricity grid in such a way that the overall system can operate safely and in a cost-effective manner is becoming increasingly important. The measures currently targeted include:

- Increased utilisation of the existing network in order to increase the transport capacity of the networks (see 3.4.2.i).
- The more efficient organisation of redispatch to gradually introduce a predictable process with balance sheet and energy balance has been implemented by law. The aim of the introduction of redispatch 2.0 is to increase efficiency by overall optimisation of the redispatching system across the network. The network operators are currently implementing the requirements in practice. Cross-border redispatching is to be transferred to a European regime in order to strengthen cross-border trade (see also 3.4.3.i.).

Monitoring of barriers to flexibility and identification of flexibility potentials

The integration of renewables into the electricity market requires inter alia demand-side flexibility. Flexibility (both on the market and on the network) is therefore increasingly important. The aim is to look at the many technological, market, regulatory and interdependency aspects and interdependencies in an overall systemic perspective in order to harness flexibility needs and potentials for the benefit of the system.

In the framework of the Climate-Neutral Electricity System (PKNS) platform, the WG ‘Extension and integration of flexibility options’ discussed how flexibility options can be used to balance the balance of the system and how to integrate it into the electricity system, and what obstacles and barriers need to be removed. Options focused on demand-side flexibility options were also discussed with stakeholders. These will be further consolidated into a “option paper” to serve as a basis for policy decision-making after a written consultation.

Currently, there are still rules that make it difficult for market players to behave in a flexible way, so-called “flexibility barriers”. If all technologies are to have the same market access, this means reducing these barriers to flexibility. In line with the recently adopted reform of the EU Electricity Market Regulation requires Member States to submit a report on flexibility needs (following the adoption of a methodology by ENTSO-E/ACER). This report aims to analyse the different flexibility needs and potentials, with a focus on ensuring security of supply and supporting the decarbonisation of the electricity sector. Germany will then derive an indicative target for non-fossil flexibility by showing the contributions of Lastflex and Storage to the overall target.

It is particularly cost-effective if the various options for flexibility – developed electricity grids, flexible power plants and consumers, storage, electricity exchanges with European neighbours – compete with each other. It is not intended to favour certain technologies through one-sided support and exemptions. This can be better decided by the market.

Electricity storage strategy

Electricity storage can provide flexibility not only in the short term to compensate for volatile solar and wind energy production. They also offer network and ancillary services and can provide controllable capacity. Electricity storage, in particular battery storage, will play an increasingly important role in the supply of energy in Germany in the coming years, purely market-driven. This is already evident from the impact of the strong solar photovoltaic (PV) surge: The more solar modules are installed, the lower the market value of solar electricity. Stock exchange electricity prices become even negative in increasingly high feed-in situations. Without an appropriate level of battery storage, solar energy threatens to 'canabate'. For this reason, it can already be observed today that battery storage is often planned directly in new solar parks.

In addition, the strong rise of private roof PV leads to almost as strong growth (80 % of private PV combined with battery storage) in home storage systems to consume renewable electricity themselves as much as possible instead of feeding it into the general supply network.

Currently (as of May 2024) stationary batteries are installed in Germany with a total capacity of 13.4 GWh, more than doubling since January 2023.

Because of this great practical relevance, the Federal Ministry of Economic Affairs and Climate Protection presented an electricity storage strategy in December 2023. This identifies areas for further support for market uptake and system integration. Areas of action include consideration of electricity storage in the context of the Renewable Energy Act, licensing issues, network charges, construction cost subsidies, grid connection acceleration, system stability, bidirectional charging and other topics.

Thermal storage strategy

The heat storage strategy will address the storage capacity in buildings and the resulting flexibility options for the electricity grid. In addition, short-term and seasonal storage in heat networks and storage requirements for process heat will be dealt with therein. The need for cooling in the various sectors will also be taken into account.

Heat storage should ultimately also help to make energy demand, and in particular electricity demand, more flexible in space and time. In the building sector, they can, among other things, increase the self-consumption rate of self-generated electricity, thus helping to avoid grid bottlenecks.

3.4.3.iii. Where applicable, measures to ensure the non-discriminatory participation of renewable energy, demand response and storage, including via aggregation, in all energy markets

3.4.3.iv. Policies and measures to protect consumers, especially vulnerable and, where applicable, energy poor consumers, and to improve the competitiveness and contestability of the retail energy market

In Germany, competition among suppliers in the retail energy sector is high. Already today, there are as many players active in the German electricity market as barely anywhere else in the EU. According to the Federal Cartel Office's Market Power Report 2022, only RWE was clearly above the presumption of dominance. LEAG and EnBW are approaching this threshold. The number of electricity and gas suppliers in Germany has steadily increased in recent years. In 2022, more than 1400 electricity suppliers and more than 1000 gas suppliers were active on the German retail market. In addition, retail prices for electricity and gas are not subject to state regulation. They are freely established on a competitive basis. In most distribution areas, more than 100 different suppliers offer supplies to household customers. Competitive pricing and market liberalisation will continue to be the basis for maintaining a high level of competitiveness in the electricity and gas retail markets.

Protection of energy consumers and competitiveness/market integration at national and European level

There are a wide range of consumer protection measures in Germany. Examples include the existing transparency requirements. It is also worth mentioning the possibility for consumers to call on the Energy Conciliation Body to resolve disputes out of court concerning connection to the supply network, supply of energy and measurement of energy. As a general rule, the conciliation procedure free of charge for consumers, in which energy utilities must participate (charged), should not exceed three months and should end with a recommendation from the conciliator. Even if the

A recommendation on conciliation is not binding, many suppliers comply with it. With the market watchdog energy, the Federal Association of Consumer Centres and the Consumer Centres specifically monitor the energy market from the point of view of consumers. Individual complaints can thus form an overall picture. This helps consumers protect consumers to identify and draw attention to malpractices at an early stage in order to avoid consumer harm. In doing so, the market gatekeeper also contributes to a cost-effective and socially fair energy transition for consumers. The Electricity Directive has introduced a variety of measures to protect consumers and strengthen consumer rights. These are mainly aimed at increasing transparency for consumers and include, inter alia, additional, infra-annual, free billing information, minimum requirements for billing and billing information, or the introduction of standards for electricity comparison portals. Germany has transposed the measures into national law if they do not already exist at national level.

Concept of basic and substitute supplies

The existing concept of basic and replacement services also serves to protect household customers. This ensures that, in principle, every household customer has a statutory right to be supplied with electricity or natural gas by the primary supplier in accordance with its published General Conditions and General Prices. This is done by imposing a one-sided obligation to contract at the expense of the energy supply company in each case, within the limits of economic reasonableness. For example, the law restricts the basic supplier's right to interrupt delivery immediately or to disengage from the customer in the event of late payment. Nor is there a minimum contractual duration for the provision of basic services; it can be terminated at any time and without any need for the customer at short notice.

Protection against supply disruptions

In order to protect against supply disruptions, there are several levels of protection, in particular for vulnerable customers.

benefit and avoid fast supply disruptions in case of payment backlog.

A threshold of arrears must be reached (at least two monthly invoices and at least EUR 100) before supply disruptions. A warning with the threat of blocking must then give the customer a minimum period of four weeks. A specific interruption must be announced with a deadline of eight days, and at the same time the conclusion of a waiver agreement must be offered which, in addition to an interest-free instalment agreement, includes a further payment on an advance basis.

It follows from the time limits that a blocking can only take place after more than three months after the first non-payment of the invoice, if the conclusion of a waiver agreement was also unsuccessful. In the case of part-payments, this period is extended (as at least two monthly arrears are requested before the termination date).

Most recently, legal adjustments in the context of rising electricity and gas prices have strengthened protection against supply disruptions due to non-payment of the bill.

The conclusion of a prevention agreement for consumers was also significantly facilitated overall and extended to energy supply contracts outside the basic supply sector. In particular, compliance with the obligations under the prevention agreement is to be facilitated by the fact that, in the case of higher debts, the prevention agreements must be concluded over a longer period, so that the instalments do not overburden the parties concerned. In addition, it was stipulated that consumers may request a suspension of the monthly instalment agreement for up to three monthly instalments during the period of a waiver agreement. In addition, the levels of protection already in place in basic services, which benefit in particular vulnerable customers and avoid rapid supply disruptions in the event of a payment backlog, have

been further strengthened and initially transferred to special contracts for a limited period of time.

In addition, both the basic provision for jobseekers under SGB II (citizen's allowance) and social assistance under SGB XII have a wide range of support options to prevent electricity disconnections. Where payment obligations for energy costs cannot be met and the energy supply has been or is at risk of being blocked, loans or, exceptionally, subsidies are eligible (cf. Sections 24(1) and 22(8) SGB II; Sections 37(1) and 36(1) of SGB XII). Assistance under § 36(1) SGB XII is also possible for persons who are not otherwise entitled to benefits under SGB II or SGB XII (cf. § 21 sentence 2 SGB XII). In accordance with SGB II, for the month in which an annual bill for heating energy costs or expenses for an appropriate stockpiling of heating fuel is due, benefits may also be obtained from persons who are not otherwise entitled to citizen allowance (cf. § 37(2), third sentence, SGB II; one-off citizen's allowance). The same applies to persons who are not or are no longer fit for work in social assistance (§ 35(5) SGB XII). In addition, both basic social security benefits for jobseekers and social assistance can be provided directly to the energy supplier in order to avoid the risk of electricity disconnection in advance (cf. § 24(2), § 22(7) SGB II; § 35(3) SGB XII).

Amendment of the distance allowance for remote commuters

Commuters who have to make a long journey to work, especially in rural areas, are often unable to rely on an upgraded local public transport service, nor are there already sufficient charging infrastructure and vehicles with the appropriate reach to switch to e-mobility in the short term. This will change in the coming years. As a result, the flat-rate commuter allowance from 2021 onwards became available from 21st Kilometres to 35 cents and again from 2022 to 38 cents until 31. December 2026.

Changes in housing allowance, rental law and energy law

In order to avoid social hardship in the event of rising heating costs, recipients of housing benefit are supported by an increase in housing benefit as a result of the 2020 climate change programme. The housing benefit CO₂ component, which entered into force in 2021, is a supplement to the amount to be taken into account

Rent and leads to a higher housing benefit in the calculation of housing benefits. In addition, the Law on the sharing of carbon costs created a fair sharing of CO₂ costs between tenants and landlords, according to their influence on the energy consumption of the building. This leads to a double incentive effect: For end-of-rents to be energy-efficient and for renters to invest in climate-friendly heating systems or energy renovations. The law entered into force on 1 January 2023 and applies to new heating and hot water billing periods starting from 1 January 2023.

With the entry into force of the Housing Benefit Plus Act on 1 January 2023, the Federal Government also implemented the most comprehensive improvement in

housing benefit so far. The Federal Government has thus created the legal basis for reducing the costs of housing and heating costs to lower incomes in Germany to an even greater extent than in the past. The reform focuses on increasing the entitlement to housing benefits and extending the scope of the housing benefit by introducing a heating cost component, a climate component and an increase in the general level of benefits. The climate component in the housing allowance (a supplement to the maximum rent of the housing allowance of EUR 0.40 per square metre) acts as a low-bureaucratic cushion for higher rents in the energy-efficient housing stock and new buildings. The Housing Benefit Plus reform more than doubles the housing benefit of existing beneficiaries on average from around EUR 180 to around EUR 370 per month, while the number of housing benefit households increases from around 600,000 to around 2 million.

Transfers

Increased energy costs are already taken into account in transfers in accordance with the established procedures. In the case of the existence of security systems under SGB II and SGB XII, this means that reasonable expenditure for heating energy does not result in unreasonable costs merely due to rising prices per unit of quantity. The evolution of household flow prices is taken into account when determining the level of normalised demand and then in the annual updates.

Structural accompanying measures related to the phasing-out and reduction of coal-fired power generation

The Federal Climate Protection Act provides for a reduction of at least 65 % of German greenhouse gas emissions by 2030 compared to 1990 emissions. Phasing out the thermal treatment of coal (in particular lignite) will make a substantial contribution to achieving these objectives. However, the coal phase-out poses structural policy challenges to lignite sites (and to the locations of coal-fired power plants). In order to actively shape structural change in these regions, the Bundestag, with the consent of the Bundesrat, adopted the Structural Reinforcement Act on Coal Regions in August 2020. As part of the Act, the new Coal Regions Investment Act (InvKG) entered into force on 14 August 2020. The Federal Government thus helps the regions affected by the coal phase-out to cope with structural change. This concerns both lignite regions and locations of coal-fired power plants. The so-called first pillar of the InvKG includes federal grants for particularly important investments by the Länder and their municipalities and associations of municipalities in the lignite areas (see Chapter 1 of the InvKG). Project selection and implementation are the responsibility of the Länder. In total, up to EUR 14 billion will be available to the countries by 2038. The second pillar of the InvKG includes measures under the Federal Government's own responsibility (see Chapters 3 and 4 of the InvKG). Up to EUR 26 billion will be provided to lignite regions by 2038.

The measures of the InvKG include, inter alia, the extension and establishment of

federal programmes and initiatives (cf. § 17 InvKG), the STARK Federal Programme (cf. § 15 InvKG), the establishment of federal institutions in the Revieres (cf. § 18 InvKG) and additional investments in federal trunk roads/railways (cf. Chapter 4 InvKG). The aim of the newly created STARK Federal programme is to support non-investment projects in the assisted areas of the InvKG. In Section 18 of the InvKG, the Federal Government undertakes to create at least 5000 new and additional jobs in federal authorities and other bodies in coal regions by 31 December 2028.

In order to optimise the interaction between the measures of the Federal Government and the lignite Länder, the InvKG provides for the creation of a Federal-Länder coordination body (Bund-Länder-Coordination Board). Since August 2020, it has been assisting and assisting the Federal Government and the governments of the Länder in the implementation and implementation of the measures, in particular through its recommendations (§ 25(1), sentences 2-5 InvKG). This is to ensure that the money is only used to finance projects that have a high effectiveness in the sense of the InvKG's funding objectives. The BLKG also plays an important coordination role on the federal side. Thus, measures under Chapters 3 and 4 of the InvKG are not included in the federal financial planning until they have been adopted by the BLKG. On 10 August 2021, the Coal Administrative Agreement entered into force for structural aid for the sites of coal-fired power plants as well as for the former lignite site Helmstedt (see Chapter 2 InvKG). In total, structural assistance of up to EUR 1.09 billion is available to the countries concerned in this context until 2038 at the latest. The Land of Thuringia will receive up to EUR 90 million from the funds for the Central German Forest for the former lignite-fired area of Altenburger Land.

The term 'structural aid' covers both federal grants for particularly important investments by the Länder and their municipalities and associations of municipalities and other federal measures to promote structural change. With the administrative arrangement for structural assistance, the countries concerned have essentially opted for the grants. Project selection and implementation are also the responsibility of the Länder.

3.4.3. v. Description of measures to enable and develop demand response, including those addressing tariffs to support dynamic pricing

Dynamic electricity price contracts and smart meters

Under the Electricity Directive, electricity suppliers will be able to offer dynamic electricity price contracts.

The 2021 amendment to the EnWG transposed the requirements of EU law on electricity supply contracts with dynamic tariffs into German law. In Germany, pursuant to Section 41a(1) EnWG, suppliers must, where technically feasible and economically reasonable, offer a tariff for the final consumption of electricity that incentivises energy saving or management of energy consumption.

The provision in Section 41a(2) EnWG, most recently further developed by the Act on the Restart of Digitalisation of the Energy Transition (Article 1 of the Act of 22 May 2023, BGBl. 2023 I No 133), applies specifically to customers with smart metering systems. It now requires all electricity suppliers – irrespective of the number of customers – to offer mandatory dynamic tariffs to their smart metering customers from 2025 onwards. Currently, only suppliers supplying more than 100.000 final consumers have to offer a dynamic electricity tariff to their customers using smart metering. This requirement is supported by the improved data base for network operators and market actors introduced by the GNDEW, in particular in the form of quarter-hour values and improved network state monitoring.

At the same time, the GNDEW significantly accelerates the roll-out of smart metering systems and reduces red tape. In particular, a statutory roll-out roadmap with binding targets and concrete timeframes has been established; the requirement for market analysis and market declaration by the Federal Office for Information Security (BSI) is not applicable.

Establishment of a market master data register

The Bundesnetzagentur's market master data register became operational at the beginning of 2019. The register collects the master data of all power supply installations in the electricity and gas markets in Germany and market actors and stores them in a single online database. To the extent permitted by data protection law, the data stored are available on the internet [at www.marktstammdatenregister.de](http://www.marktstammdatenregister.de).

Speeding up and de-bureaucracy of the rollout of smart metering systems, consistent evolution to smart grids

Consistent digitalisation is more important than ever for the Federal Government's climate and energy transition objectives. The massive roll-out of renewable energies and the increasing sector coupling in mobility and heat require accelerated digitalisation. With the transformation of Germany's energy system towards more renewable energy, the requirements for secure and efficient system operation are increasing. In the future, electricity producers and consumers will connect and communicate digitally via a smart grid. A high level of resilience and cybersecurity, synergies and maximum systemic benefits through a platform approach are the strengths of the Smart-Meter Gateway (SMGW).

In Germany, the Measurement Station Operation Act (MsbG) has been the legal framework for the installation and operation of smart metering systems ('smart meters') since 2016. MsbG requires the roll-out of certified devices with a certificate issued by the Federal Office for Information Security (BSI), which guarantees IT security and privacy by design. Currently, five smart meter gateway manufacturers have successfully completed all certifications. In order to maximise the benefits, the MsbG standardises the Smarteter Gateway as a communication platform for many use

cases (Smart Metering, Smart Grid, Smart Mobility, Smart Home, Smart Services) through extensive protection profiles and technical guidelines. The technical standards will be continuously developed in line with the requirements of the energy transition.

The Act relaunching the digitalisation of the energy transition (GNDEW – Entry into force on 27 May 2023 (BGBl. 2023 I No 133) amended the MsbG in particular and now makes the installation of smart meters less bureaucratic and easier. In future, the smart meter rollout will no longer need to be released by the Federal Office for Information Security (BSI). The focus here is on the safe control and switching of installations and flexible consumption facilities by network operators and market players via SMGW, which will be provided across the board from 2025 onwards. The BNetzA's provisions under 14a EnWG and BSI TR-03109-5 'Communication adapters' (TR 5), which entered into force at the same time on 1 January 2024, provide further decisive framework conditions.

System operators and market actors also receive the necessary data for a smart energy system designed for renewable energy through network state data and quarterly metering.

Only efficient roll-out on the basis of a cost-benefit assessment is still allowed: Statutory price caps ensure acceptance and economic viability. Direct costs (measurement charges) for consumers and small-scale operators have been significantly reduced by the GNDEW by capping the cost of a smart metering system to EUR 20 per year (corresponding to today's price cap for the modern household metering equipment). At the same time, network operators will be more involved in bearing the costs.

3.4.4. Energy poverty

3.4.4.1. Where applicable, policies and measures to achieve the objectives set out in point 2.4.4

The Federal Government takes a comprehensive approach to poverty reduction, which does not focus on individual demand elements, such as energy. Costs incurred by households in obtaining energy are taken into account in the same way as other elements of the need to exist. The existing legal arrangements include both financial support for those in need over a longer period of time and in specific emergency situations, such as threats of disruption of supply (see Chapter 2.4.4).

3.5. Dimension Research, innovation and competitiveness

3.5.1. Policies and measures related to the elements set out in point 2.5

Support for energy research by the Federal Government

The Federal Government's support for energy research is coordinated by the coordination platform for energy research policy. The focus of energy research funding is the result of extensive consultation processes with stakeholders from academia, business and civil society. For the reporting period, in particular, the 7th Energy research programme and the 8th

Energy research programme on applied energy research.

The 'energy transition regulatory sandboxes' were adopted in the 7th Energy Research Programme establishes an action that specifically supports projects that systematically test innovation and research results on a real-world and industrial scale basis. They enable the acceleration of technology and innovation transfer by closing the gap between research and energy practices: the pre-market general sample. The transfer will be supported through networking activities (in particular energy research networks) and research communication. In addition, start-ups play a crucial role in the transfer.

Research initiative on prevention of process emissions in industry

More than a third of industrial emissions – almost 8 % of Germany's total greenhouse gas emissions – are due to production processes in the basic materials industry. In the area of industrial process emissions, a new research initiative will be launched to enable the German raw materials industry to research and develop processes and combinations of processes that contribute to the direct avoidance of greenhouse gases in key sectors such as iron and steel, cement and lime, chemistry and non-ferrous-metals. In addition to technological innovation, the funding guidelines focus on economic conditions and the competitiveness of the procedures developed, the optimisation of which is to be examined by research.

Finance and climate action

At the heart of this is the capacity building of a strong and actionable research community in Germany in the field of finance and climate protection. The research projects and a scientific support project address issues at the interfaces between the real economy and the financial sector (products, processes and market mechanisms to finance climate change mitigation; the impact of sustainable financial products; the identification of the needs of investors and private customers, and

Interactions between societal developments, climate change and the financial sector). There is a close link with the German Sustainable Finance Strategy in order to achieve deeper dialogue, optimal networking and the greatest possible impact of sustainable finance science in Germany.

National Bioeconomy Strategy

The aim is to develop sustainably produced bio-based products and bio-based production processes, including through the substitution of fossil-based products and the recycling/use (reprocessing) of consumer goods for new products (cascading, circular economy). New measures include:

Future technologies for the industrial bioeconomy (biohybrid technologies: Electro-biosynthesis and photobiosynthesis on CO₂ use), support phase 3 of the Zero-CarbFP Alliance (material use of carbon-rich waste streams for the production of functional biomass and the production or recovery of valuable materials using biotechnological processes) and microbial biomanufacturers (CO₂ use in biotechnology).

Future construction of pilot projects for innovation in buildings

This pilot project will usefully complement the BMWSB's Future of Building Innovation Programme, with its portfolio research and research funding components, in order to support specific construction and application projects of an innovative character.

Testing novel solutions in the real world of construction, modernisation or deconstruction of buildings (residential and non-residential) will support market entry and approval of these solutions. The application of innovative solutions across the board and the further diffusion of this solution into general planning and construction practices can be encouraged. The aim of the pilot project is to introduce more novel solutions to climate-neutral, climate-adjusted, resource-efficient, health-friendly and affordable construction in general planning and construction practice, which are not yet customary on the market, in particular in existing buildings.

Federal Government Woodbau Initiative

The Federal Government's Woodbau Initiative, adopted in the Cabinet on 21 June 2023, aims to strengthen the use of wood and other renewable raw materials in the construction sector, thus increasing climate protection, resource conservation and faster construction. Eight areas of action show what the federal ministries in question intend to implement by 2030 under their own responsibility and subject to the budget made available. These include the role of the Federal Government as an example, strengthening research and innovation, securing skilled workers and knowledge transfer, securing the supply of raw materials, and supporting circular and resource-efficient construction. It will also reduce barriers and ensure a level playing field for the use of a wide range of building materials.

Research and observation of aerosols, clouds and trace gases within the European research network ACTRIS

ACTRIS (Aerosol, Clouds and Trace gas Research Infrastructure) was established on 25 April 2023 under the legal form of a European Research Infrastructure Consortium (ERIC) by European Commission Implementing Decision. The objective of ACTRIS is to

monitor and investigate aerosols, short-lived climate-relevant trace gases (SLCP) clouds and air pollutants. The investigations shall cover, in particular, their spatial and temporal distribution. The lessons learned provide an important scientific basis for future policy decisions on climate change and air pollution. Action on short-lived climate-relevant trace gases has the advantage that the impact on the climate occurs without significant delays due to the short duration of the gases in the atmosphere. In addition, synergies between climate protection and air pollution can be exploited. ACTRIS brings together research organisations from 16 European countries. Germany is a founding member of ACTRIS at European level. Many German research organisations are involved in ACTRIS. It is in the interest of Germany to strengthen the networking of the leading European research institutes in the field of air pollutants and short-lived climate-relevant trace gases. The

The Scientific Council has consistently positively assessed the ACTRIS project. The German research institutions involved in the process have a high level of scientific expertise.

Research on carbon removal from the atmosphere (Carbon Dioxide Removal, CDR)

The active removal of CO₂ from the atmosphere (Carbon Dioxide Removal (CDR)) and the subsequent permanent storage is necessary in addition to the emission reduction in order to achieve the climate objectives. The Federal Government supports land-based CDR methods in the 'CDRterra' research programme and marine CO₂ removal methods in the research mission 'CDRmare'. CDRterra explores terrestrial CDR methods for large scale feasibility as well as interactions with other sustainability objectives and complex Earth-climate interactions. In addition, CDRterra seeks a comparative analysis and assessment of the different CDR methods and explores cross-cutting issues on political and institutional feasibility, social acceptance and ethics. The CDRmare research mission explores the role of the ocean in removing and storing CO₂ from the atmosphere. It also looks at interactions with and impacts on the marine environment, the Earth system and society, as well as appropriate approaches for monitoring, attribution and accounting of marine carbon storage. In the long term, a Marine Carbon Roadmap will be developed.

Innovation and Competitiveness

Net Zero Industry Act (NZIA)

The NZIA was adopted by the European Parliament on 25 April 2024 and has now been formally approved by the Council of Ministers on 27 May 2024. It is expected to enter into force in July 2024. As an EU regulation, the NZIA is directly applicable. National implementation in line with the Regulation (harmonisation of national law, implementation, coordination between the competent bodies) is currently being developed by the Federal Ministry of Economic Affairs and Climate Protection.

The NZIA intends to simplify and accelerate the ramp-up of net-zero technology (NNT) production (solar, wind, batteries, heat pumps and geothermal energy, electrolysers, biomethane technologies, CCS, electricity grid components, etc.). One of the objectives of the NZIA is to meet at least 40 % of the EU's total annual supply needs by 2030 from its own production. This will include the following measures:

- Reduction of administrative hurdles (in particular authorisation procedures with time limits; Setting up one-stop shops);
- Identification of Net-Zero Strategic Projects that are particularly privileged;
- Designation and deployment of NetZero Acceleration Valleys for technological clustering and simpler permitting procedures;
- Establish a Net Zero Industry Platform for exchanges, e.g. on financing issues and discussion of issues;
- Facilitating market access, in particular through demand-side stimulus (criteria in public procurement and renewable energy auctions).

Energy-intensive industries, such as steel, chemicals or cement, that produce components for these net-zero technologies and invest in decarbonisation can also be supported by the measures of the law.

OECD Guidelines for Multinational Enterprises on Responsible Business Conduct

The Federal Government is a signatory to the OECD Guidelines for Multinational Enterprises on Responsible Business Conduct (OECD Guidelines) and as such promotes the dissemination and implementation of the OECD Guidelines. The OECD Guidelines were revised in 2023 and since then have also covered climate change and adaptation in the environmental chapter. The promotion of the OECD Guidelines supports:

Federal Government sustainable supply chains and an international level playing field in general and for net-zero technologies.

Further development of CO₂ uses under ccu/CCS

The further development of uses of CO₂, the so-called CCU based on renewable energy, is already widely supported in Germany and is the subject of numerous research and development projects. With 'Carbon2Chem' and 'CO₂-WIN', the Federal Government has set up its own support programmes for CO₂ exploitation, which are aimed primarily at expanding the raw material base and strengthening raw material independence. In addition, from the beginning of 2024, excellent young people will be supported under the Sinatra support measure. These will examine different parts of artificial photosynthesis (Sunlight-to-X).

Cooperation with the US Department of Energy (DoE) will be deepened. Germany is also involved in ERA-Net Cofund ACT (Accelerating CCS Technologies), which promotes larger projects as well as the full range of the CCS and CCU technologies

process chain, i.e. capture, transport, storage or use of CO_2 . Germany participates in the EU-funded SUNERGY Initiative and the International Mission Innovation Community on Sunlight-to-X, which, among other things, promote a circular carbon economy (fossil-free motors and chemicals). The capture of CO_2 from the atmosphere (DAC) is becoming more prominent and a CO_2 technology under the 7th Energy Research Programme.

CO_2 storage for research purposes is currently not taking place in Germany.

CO_2 -Prevention and use in basic material industries

The programme focuses on emissions reduction in the basic industry.

Carbon Direct Avoidance (CDA):

Part of the programme are those CO_2 avoidance actions that are implemented together within a project with CCU/CCS and are therefore an integrated part of a CCU/CCS action. As part of this, innovative

Includes technologies that lead to a significant reduction in greenhouse gas emissions in the basic materials industry.

Carbon Capture and Utilisation (CCU):

In addition, approaches and technologies for efficient circularity of CO_2 are part of the programme; these include technologies for capture, use, inter alia, of the bioeconomy, but above all also those that enable recycling after CO_2 use.

Carbon Capture and Storage (CCS):

According to the IPCC, CCS is part of a large number of scenarios for meeting the Paris climate goals, alongside immediate, rapid, far-reaching and sustained emission reductions. With the Paris Agreement, States Parties, including Germany, have committed to keep the global temperature increase well below 2°C and to pursue efforts to limit it to 1.5°C . The IPCC shows that CCS has a lower emission reduction potential by 2030 compared to renewable energy and increased energy efficiency.

However, certain sectors and processes will continue to generate greenhouse gases, such as cement and lime industries, basic chemicals and waste incineration. The Federal Government also wishes to enable these sectors to achieve climate-neutral economies in Germany. Therefore, with the Carbon Management Strategy (CMS), it will now lay the foundations for the safe use of these technologies and for the transport and storage of CO_2 .

For the further development of the carbon management strategy, the Federal Government will take the following steps:

- The existing barriers to the application of CCS/CCU in Germany will be

removed. At the same time, masterplans for the use of these technologies will be defined.

- The ramp-up of CCS/CCU must be in line with the German greenhouse gas reduction targets.

The Climate Change Act (KSG) and the achievement of net zero greenhouse gas emissions in 2045.

- In order to avoid GHG emissions in electricity generation, the Federal Government relies on the accelerated expansion of renewable energies and, in addition to and in anticipation of the capacity mechanism described in the power plant strategy, the construction of new gas-fired power plants converted to hydrogen. For power plants using gaseous energy sources or biomass, CCS/CCU is also legally possible in the sense of a technology-open transition to a climate-neutral electricity system, but is not promoted in any case for fossil fuels.
- Coal phase-out remains: For emissions from energy production from coal (power and heating plants), access to CO₂ pipelines and CO₂ storage is excluded.
- State support for CCS/CCU focuses on heavy or unavoidable emissions.
- Exploration of offshore storage sites in the German Exclusive Economic Zone (EEZ) is permitted by law. In the case of proven suitability for location, taking into account safety standards and environmental criteria and spatial planning, appropriate storage facilities for industrial use may be developed. In order to take account of the specific protection of marine protected areas, the injection of CO₂ into MPAs and in a buffer zone of 8 km around it and within a coherence area is prohibited. On the other hand, storage under marine protected areas is excluded and noise-intensive activities are prohibited in the main concentration area of the harbour porpoise in the months of May-August.
- The Federal Government will create a legal basis in the KSpG allowing individual Länder to opt for onshore storage. Onshore storage to:

Regardless of this, research is made possible nationwide.

The key points are currently in the parliamentary procedure. In parallel, the Federal Government will further develop the comprehensive CMS.

Many mitigation strategies to achieve the global temperature goals of the Paris Agreement also use so-called 'negative emissions'. Carbon removal from the atmosphere can be achieved in addition to natural methods, e.g. through forests, with technologies such as BECCS (Bioenergy and Carbon Capture and Storage) and DACCS (Direct Air Carbon Capture and Storage). For these technologies, the elements of the whole CCS process chain would need to be available. The long-term negative emissions

strategy (LNE) is currently being drawn up to deal with unavoidable residual emissions and the role of carbon removals for climate protection in Germany. Both the CMS and the LNE are part of an overall approach to decarbonising the economy and are closely coordinated.

EU ETS Innovation Fund: Further development of the NER300 programme

Under the European Emissions Trading System, the so-called NER300 programme has been in place since 2011, which supported investments in innovative low-carbon demonstration projects in the energy sector. The funding budget was financed by the sale of 300 million EU ETS allowances. With the entry into force of the current EU multiannual financial framework of 2021-2027, it was replaced by the EU funding format 'Innovation Fund'. The objective and subject matter is a financial instrument to fulfil the EU's commitments under the Paris Climate Agreement.

The Innovation Fund support focuses on innovative renewable energy technologies and processes in energy-intensive industries, such as the Carbon Capture Utilisation and Storage Technology (CCUS), innovative renewable energy production and energy storage.

National decarbonisation programme

The action is a support programme for development, demonstration and market uptake. In order to reduce emissions in the industrial sector as far as possible, it is necessary to reduce to a large extent or completely also process-related GHG emissions which, according to the current state of the art, are impossible or difficult to avoid. To this end, support will be given to key projects in the field of emission-intensive industries. These will serve both application-oriented R & D and industrial-scale testing and wide market uptake of mature technologies and focus on their economic viability. In particular, the support programme shall promote the reduction of GHG emissions in the production of emission-intensive goods as much as possible, the optimisation of process chains, the transition of processes to the use of renewable energy sources and raw materials, and the substitution of emissions-intensive goods and technologies for the conversion of hydrogen, as well as technologies for the use of CO₂. The support programme is implemented by the Competence Centre for Climate Action in energy-intensive industries (KEI) in Cottbus. The KEI also acts as a think tank and cross-sectoral, international and interdisciplinary knowledge platform on industrial decarbonisation. Programme "Intelligent Energy Window – Digital Agenda for Energy Transition" (SINTEG)

In parallel to the energy research programme, the SINTEG programme is developing and demonstrating solutions to the technical, economic and regulatory challenges of the energy transition in five large model regions – so-called showcases – with over 300 companies and other actors. It focuses in particular on secure, efficient and mass-business processes, innovative technologies and market mechanisms for flexible,

smart grids and markets. The focus is on the digitalisation of the energy sector. The objective of the programme is also to gather practical experience for the future development of the legal framework. To this end, the Federal Government adopted the SINTEG Regulation, which entered into force on 21 June 2017, with temporary 'experimentation options'. The Regulation will allow SINTEG participants to test new technologies, processes and business models, such as digitalisation and sector coupling, without economic disadvantages.

Research and innovation agenda on the material use of CO₂

This action addresses the use of CO₂ from industrial emissions as a raw material to support a carbon neutral circular carbon economy. The material use of fossil carbon is the basis of today's chemical value chain. The use of, for example, petroleum-derived naphtha leads to significant CO₂ emissions over the life cycle. The efficient use of CO₂ as a carbon source combined with renewable electricity can open the way to a circular economy and significantly reduce the carbon footprint of industries and products. The R & I Agenda brings together promising research approaches, including through the long-term establishment of early-stage groups on "Artificial Photosynthesis" and "Using alternative raw materials for hydrogen production". The aim is to identify future research directions and to support ways of industrial application.

Better participation of start-ups in energy research

Reducing energy consumption and greenhouse gas emissions requires leaving previous technological pathways and developing new innovative solutions. Start-ups often play a crucial role in developing innovative ideas and problem-solving. They contribute significantly in the future to the success of the energy transition. The traditional instruments and mechanisms for project funding were too rarely tailored to these actors. The Federal Government therefore aims to better target start-ups with new and adapted funding formats in the context of energy research funding and to increase their participation in all areas of energy research. To this end, existing barriers will be gradually removed: On the one hand, by extending the content of the programme to non-technological innovations (business models, new services) linked to technological innovations. On the other hand, by adapting and speeding up administrative procedures (e.g. micro-projects) and new, more agile projects, as well as building up the

Networking platform Startups. Start-ups with innovative ideas on the energy transition should be able to launch collaborative projects with partners from academia and business by making it easier to launch collaborative projects with partners from academia and business, thus giving a new impetus to energy research.

Technologically Sovereign Batteries – The BMBF roof concept battery research

Electrification of industry, transport and other sectors is essential to: Significantly reduce greenhouse gas emissions and achieve net-zero emission targets, including those enshrined in the EU's Net-Zero Industry Act. The key role of battery technologies in achieving these objectives is reflected, inter alia, in the current ramp-up of battery (cell) production in Europe. The development of battery technologies and production capacities is progressing rapidly. Germany's resilience and competitiveness in battery technologies must be further strengthened in the light of geopolitical challenges and the still strong dependence on non-European suppliers, such as battery materials and machinery and plant manufacturing.

For this reason, the Federal Ministry of Education and Research (BMBF) reordered its strategic framework for battery technology research with the BMBF umbrella concept for battery research published in January 2023. The support initiatives and measures under this umbrella concept take into account research and development from material to battery cell, from basic research to scaling in industrial production processes, and focus on aspects of digitalisation and, in particular, the circular economy. Education and training aspects, especially those of young scientists, are also deliberately promoted. The aim is to create the technological base for building an environmentally friendly, competitive and technologically sovereign battery value chain in and for Germany and Europe. This objective is currently acutely jeopardised because BMBF's battery research is mainly financed by the Climate and Transformation Fund (KTF). The money provided for this was set at zero for new projects as part of the austerity measures around the KTF.

Key areas of mobility: (A) Urban mobility B) Systemic barriers to innovation climate change mitigation

This is about the development of effective mobility concepts linked to social and technological innovations based on a systemic perspective. The impact of decarbonisation will be identified through analyses of the interplay between mobility flows, infrastructure networks, value chains, urban and spatial planning, and individual and societal needs. The support aims, on the one hand, at developing and testing climate-friendly mobility innovations in regulatory sandboxes. On the other hand, it aims to provide a basis for long-term innovation and transformation management. Two sub-measures are:

- urban mobility; and
- systemic barriers to innovation for climate action, following on from the results of the National Mobility Platform (NPM).

Digital Innovation Hub for Climate

The initiation and financing of a Digital Innovation Hub for Climate aims to connect business, academia and policy makers, strengthen application-oriented research and development in the field of climate change mitigation by sharing digital innovation, as well as the use of digital technologies in climate action and the development of business models.

Green ICT: Research and development to reduce the carbon footprint of digital technologies

The aim is to develop technological solutions to boost CO₂ consumption of digital technologies. Reducing the energy consumption of information-based components such as processors or server farms (clouds) and the associated communication technologies (ICT/ICT) already has significant potential for climate change mitigation. New digital applications are emerging, in particular in the area of:

Big Data, the Internet of Things and Artificial Intelligence, which further increase the demand for computing power for data mining. Given the rapidly growing use of these technologies in the economy, the development of technological solutions to increase the energy efficiency of ICT is essential. There are joint initiatives with the European Union, e.g. in the European Processor Initiative (EPI), which need to be developed.

Skills strategy

The Federal Ministry of Labour and Social Affairs, with the participation of all departments and numerous representatives of the Federal Government, has redrafted the Federal Government's cross-sectoral strategy for skilled workers. At the Talent Summit on 7 September 2022, the new strategy for skilled workers was discussed with the leaders of the social partners, chambers, Länder, municipalities and the Federal Employment Agency. On 12 October 2022, the Federal Government's new strategy for skilled workers was adopted.

The aim of the strategy for skilled workers is to support, through both statutory and sub-statutory measures, the efforts of companies and businesses to attract and secure skilled workers. Five priority areas for action have been identified:

1. Up-to-date training;
2. Targeted training;
3. Harnessing work potential and increasing labour market participation;
4. Improve the quality of work and the culture of work;
5. Modernise immigration and reduce emigration.

The Talent Strategy is designed across sectors and regions. Each sector and region is

invited to analyse which measures are appropriate in which sector and profession. As this varies greatly between regions and businesses, the right solutions must always be found directly by stakeholders on the ground.

The Federal Government has already implemented two key measures from the Skills Strategy with the adoption in summer 2023 of the Act on Strengthening Education and Training Support and the Law on the further development of skilled labour immigration. This has provided further levers to safeguard skilled workers.

The dual vocational education and training regulations are a central basis for the qualification of young skilled workers. The Federal Government, together with the social partners, is therefore continuously working on modernising the regulations and adapting them to the needs of the economy. The skills requirements associated with the green and digital transitions are particularly focused. Cross-professional basic skills, including in the fields of environmental protection and sustainability and the digitalised world of work, are included as a compulsory programme in all training schemes. In addition, skills relevant to transformation are included in the regulations to varying degrees and depths.

Skilled Immigration Act

Tackling skills shortages has an important role to play in ensuring competitiveness. The Federal Government adopted one of the most modern immigration laws in 2023.

The simplifications and flexibility introduced by the regulatory package are not, in principle, targeted at specific sectors, but are intended to attract immigrants from all nationalities and occupations or training courses.

With major research initiatives such as the hydrogen pilot projects or the Kopernikus projects, the Federal Ministry of Research (BMBF) is supporting research and innovation on the energy transition and the scientific basis for competitiveness. These initiatives go hand in hand with broad basic research.

3.5.ii. Any cooperation with other Member States in this field; this shall include any information on how the objectives and policies of the SET Plan are transferred to national contexts.

European energy research cooperation

Strategic Energy Technology Plan (EU-SET Plan)

As part of the EU's Strategic Energy Technology Plan (SET-Plan), Germany is actively involved in shaping European energy research. Representatives from Germany participate in the thematic working groups and formulate strategies for cooperation in the field of various energy technologies. These are: Photovoltaics, concentrated and non-concentrated solar thermal technologies, wind, geothermal, ocean energy, energy systems, positive energy quarters, HVDC & DC, energy efficient buildings, energy efficient industry, batteries, renewable fuels and bioenergy, and CCS-CCU. In addition, a new Working Group on Hydrogen is currently being set up. The results of the working groups feed into the European energy strategy, the SET-Plan.

The strategy of the SET-Plan is reflected in the national funding programmes of the Member States and was also included in the preparation of the 8th Energy research programme.

The key objective of the SET Plan is to strengthen cooperation with other Member States in the field of energy research. In the context of the 8th Energy research programme under the umbrella of the SET-Plan will boost European cooperation. The research themes of the SET-Plan are mainly implemented at European level through the co-funded Clean Energy Transition Partnership (CET Partnership).

Clean Energy Transition Partnership (Cofund)

The Federal Government participates in European and international research cooperation in the field of energy transition through the Clean Energy Transition Partnership

(CET Partnership), a grouping of national and regional donors, their funding agencies and the EU, which have published annual joint funding announcements for a variety of technologies and systems solutions since 2022. During the envisaged duration of the partnership, a total of six Joint Calls will be launched between 2022 and 2027. The annual calls launched in 2022 cover all topics under the 8th Energy Research Programme.

Germany is pushing forward the implementation of the SET-Plan implementation plans on the different technology fields in the CET Partnership thematic working groups.

European Research Network for Spatial Development and Territorial Cohesion (ESPON)

The Federal Government is participating in various European research projects in ESPON, including the ongoing project 'Territorial Cooperation for Blue Renewable Energy' (CoBren), which explores how maritime spatial planning can support the development of offshore wind energy in the various European sea basins.

Regional/Bilateral Cooperation

In addition to the 'Berliner Model' and CETPartnership collaborations, the following individual initiatives exist:

North Sea cooperation in the field of energy research

In the framework of North Sea energy cooperation, the Federal Government is helping to support the rapid development of offshore wind energy, including through joint and hybrid projects linking offshore wind farms to at least two Member States via an interconnector.

In 2022, the North Sea Summit in Esbjerg, Denmark, agreed on closer cooperation between Denmark, the Netherlands, Belgium and Germany and the European Commission to jointly produce more offshore wind energy to replace fossil energy and contribute to the EU's climate goals.

Dutch-German call for funding "Electrochemical materials and processes for green hydrogen and green chemistry"

Germany and the Netherlands together form one of the strongest industrial clusters in the world. Both countries will need large amounts of renewable hydrogen for their industrial added value and will import significant parts of it. By pooling research efforts, the two countries can accelerate the path towards climate neutrality and exploit synergies in entering a sustainable hydrogen economy. The call for funding was published in October 2022, with the first projects approved in 2023 and launched in spring 2024.

The intergovernmental Danish-German agreement on the Bornholm energy island in 2023 established a common framework for the production and transmission of 3 GW of offshore wind power near the Bornholm Baltic island to Denmark and Germany as a first implementation step.

Cooperation on CCUS with North Sea riparians

In the framework of the North Sea Basin Task Force (NSBTF), Germany, together with other North Sea neighbours, is working on scientific, technical, legal, economic and political questions on CO₂ storage below the North Sea or on CO₂ utilisation.

Greek-German research cooperation and support for early-stage researchers. Energy research is one of several pillars of research cooperation between Germany and Greece and has been addressed through two consecutive bilateral funding notices. Support was given to projects for the production, storage and efficient use of renewable energy, as well as for the environmentally sound and efficient supply of heating and cooling. A continuation of SRIA activities is under preparation.

French-German Fellowship Programme

With the Fellowship programme 'Make Our Planet Great Again – German Research Initiative' (MOPGA-GRI), the Federal Government has established a support programme in parallel with the French initiative of the same name. The objective of the action is to enable renowned researchers and promising young researchers from abroad to conduct research at German universities and research institutions. Energy research is a priority area of the initiative, alongside climate and earth systems research. Five Fellows with younger groups were supported here until 2022.

Strategic Research and Innovation Agenda (SRIA) “Green Hydrogen”

As a result of the pan-European R & I agenda process on green hydrogen, a Strategic Research and Innovation Agenda (SRIA) was published in March 2022, bringing together the main and most urgent research priorities along the entire hydrogen value chain. Member States and the European Commission are now working together on the implementation of SRIA. To this end, the Federal Ministry of Education and Research is preparing joint research cooperation with various European countries, including France, Italy and Greece. The aim of the initiatives is to strengthen cooperation in hydrogen research and stimulate innovation processes in the participating countries.

3.5.iii. Where applicable, financing measures in this area at national level, including Union support and the use of Union funds

Research

Support for energy research

Energy research will be strengthened in the period 2020-2030. As part of the funding for energy research in 2018-2022, the Federal Government allocated a total of around EUR 6.2 billion for research, development, demonstration and testing of future-proof technologies and concepts. This corresponds to an increase of around 45 compared to the comparable period 2013-2017.

Percent. Implementation is reported annually in the Federal report on energy research.

DARP

On Germany's recovery and resilience plan (DARP) and under the 7th The BMBF supports the green hydrogen flagship projects. The three large industry-led hydrogen pilot projects are developing solutions to accelerate and sustainably deliver hydrogen: H2Giga will enable future economic production of hydrogen for hydrogen, H2Mare opens completely new ways of producing hydrogen at sea and TransHyDE clarifies the routes for hydrogen transport and its distribution. You will receive, among other things, European funding from the Recovery and Resilience Facility of around EUR 700 million.

Horizon Europe – the EU Framework Programme for Research and Innovation

In the energy themes of the Climate, Energy and Mobility cluster in Horizon Europe, no other country is as strongly involved as Germany. Through the National Contact Point for Climate, Energy and Mobility (NKS KEM), the Federal Government supports the participation of German researchers in consortia and their application for EU funding. NCP KEM information and advice activities help research and industry actors to make appropriate use of the extensive and complex opportunities offered by Horizon Europe on energy issues. In order to secure Europe's ambitious energy and climate targets, themes range from applied research options to technology-oriented development themes to supporting market uptake and dissemination activities. The involvement of citizens as consumers and relevant socio-economic aspects are also becoming increasingly important.

Innovation and Competitiveness

Strengthening Germany's research location for energy storage technology

The Federal Government plans to provide research and funding for storage technologies in order to make Germany a location for battery cell production. There will also be a new Fraunhofer Institute for Storage Technologies.

CO₂- Resource efficiency and substitution savings

The funds entered under KTF titles 6092 – 686 15 will be used by the Federal Ministry of Economic Affairs and Climate Protection to finance research, development and innovation under the light construction technology transfer programme (TTP LB). Lightweight construction aims to reduce the weight of products, save materials and energy, and increase circularity, while maintaining or improving functionality. From design to production, to the use and recycling of materials and products, this can save resources and reduce CO₂ emissions.

The Small Construction Technology Transfer Programme (TTP LB) has supported politically relevant and application-oriented projects with high industrial participation since 2020 and until 2027. This will support Germany's industrial location in the important theme of lightweight construction and at the same time promote environmental and climate protection. Innovative lightweight construction technologies and materials contribute to industrial transformation and business resilience in the medium and long term in times of raw material supply shortages and rising energy prices.

Support for research SME innovation (resource efficiency and climate change mitigation)

SMEs are important drivers for climate change mitigation. With SME innovation, the Federal Ministry of Education and Research offers small and medium-sized

enterprises (SMEs) the opportunity to successfully compete on the market with new products and processes on climate protection and resource efficiency, as frontrunners in technological progress. The support initiative is widely used by SMEs across Germany.

Section b:

Analytical basis

4. Current situation and projections with existing policies and measures

The scenario with current policies and measures presented here is referred to below as a reference scenario. In this context, current policies and measures are those implemented or adopted by October 2023.

The reference scenario figures are largely based on the results of the co-measure scenario of the projections under Article 18 of Regulation (EU) 2018/1999 (Governance Regulation). The Federal Government provided these projections in an updated form in 2023 and March 2024.

Scenarios up to 2030 and 2 040 are subject to uncertainty: In general, different trajectories are estimated in different scenarios, depending on assumptions, including those relating to the implementation of current policies and measures, and on the methodology used. These differences reflect the uncertainties inherent in a multi-annual forecasting period. In addition to the present scenario, the Federal Government will therefore include, where necessary, other scenarios in its future considerations.

Account should also be taken of the fact that, in the case of greenhouse gas emissions, the breakdown by sector in the EU reporting system differs from that of the Federal Climate Protection Act. The same applies to the presentation of renewable energy shares.

4.1. Projected evolution of main exogenous factors influencing energy system and GHG emission developments

4.1.1. Macroeconomic forecasts (GDP and population growth)

The demographic change assumed in the projections is based on information provided by the European Commission. For the preparation of the projections under Article 18 of the Governance Regulation, the European Commission provides biennial assumptions on, inter alia, population trends in the individual EU countries (EC 2022). According to these figures, the population in Germany remains relatively constant at a level of 84 to just over 85 million people until the middle of the next decade (Table B1).

Table B1: Economic and demographic assumptions, GDP in real terms in 2022 prices

	IN 2021	IN 2022	IN 2023	2019 TO 2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2040	2045	2050
Population in millions	83.2	84.4	84.6	84,7	84.9	85.0	85.1	85.2	85.2	85.3	85.3	85.3	85.3	85.2	85.2	85.0	84.6	84.1
GDP in EUR billion₂₀₂₂	3816	3885	3868	3917	3977	4002	4028	4053	4080	4108	4138	4174	4213	4255	4302	4591	4887	5203

Sources: EC (2022), BMWK/BMF (2023), cf. UBA (2024)

Macroeconomic developments

For the years 2023 to 2028, the projections shall include:

Growth rates of the Federal Government’s autumn projection assumed in 2023 and growth rates of the European Commission (EC 2022) for the following years up to 2050.

Gross domestic product is growing from around EUR 3.816 billion in 2021 to EUR 4.108 billion in 2030 and EUR 4.591 billion in 2040 (Table B1).

The assumptions made here regarding the growth rates do not correspond to the current projection of the Federal Government, the spring projection 2024. As the analytical work had to start in autumn 2023, this update could no longer be taken into account.

4.1.11. Sectoral changes expected to impact the energy system and GHG emissions

The modelling assumes that the growth of value added in non-energy intensive industrial sectors is higher in the medium and long term than in energy-intensive industries (Table B2). It is true that this reduces the share of energy-intensive industries in Germany.

Gross value added is steadily decreasing. At the same time, value added in energy-intensive industries continues to grow. However, it is not possible to draw direct conclusions on the absolute level of energy consumption and GHG emissions from this structural development within the industrial sector. The development of production volumes and energy efficiency is crucial for the development of GHG emissions.

Table B2: Structural developments – Gross value added of manufacturing (industry) by sector, EUR billion, real prices 2022

	IN 2021	IN 2022	IN 2023	2019 TO	2025	2026	2027	2028	2029	2030	2035	2040	2045	2050
Energy-intensive industries	78	79	78	78	80	80	80	81	81	81	84	88	92	95
Non-energy-intensive sectors	582	593	591	594	607	613	619	624	629	635	672	723	777	832
Overall	660	672	669	672	687	693	699	705	710	716	756	811	869	927

Source: Fraunhofer ISI (2024) based on Destatis; for modelling 2024 projection data

4.1.111. Global energy trends, international fossil fuel prices, carbon price in the EU ETS

In recent years, international energy markets have experienced volatile prices (Table B3). The years 2020 and 2021 were influenced by the special situation of the global COVID-19 pandemic: First, the fall in prices due to reduced demand as a result of the reduction in economic activity and

motorised transport (mainly in 2020), and then by an increase in prices in 2021, partly due to economic catch-up effects. As of autumn 2021, prices in Europe increased in the context of tight and extremely volatile market conditions, and market trends intensified again after the start of the Russian Federation’s war of aggression against Ukraine in February 2022. In 2023, the market situation was calmed and there are signs of a return to price levels in the pre-crisis years.

Table B3: Evolution of border crossing prices for crude oil, natural gas and hard coal over the period and CO2 price 2021 to 2050

	2021	2022	IN 2023	2019 TO	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2040	2045	2050
Crude Brent in euro ₂₀₂₂ /GJ Hu	10.8	16.1	12,1	11,0	10,1	9.5	8,9	8.5	8.2	7,9	7,9	7.7	7,6		7,6	7.2	6,8	6,4
Hard coal in euro ₂₀₂₂ /GJ Hu	3.4	8.2	4.4	4.2	4,0	3.8	3.7	3.6	3.5	3.4	3.3	3.3	3,2		3.2	3.0	2.8	2.6
Natural gas in euro ₂₀₂₂ /GJ Hu	8.3	23.3	16,0	15.6	13,3	10.3	8,8	7,9	7.1	6.3	6.2	6.2	6,1		6.1	5.8	5.5	5.3
EU ETS allowances in euro ₂₀₂₂ /EEA	57.1	81,0	82,0	81,9	84.2	95.7	105,0	110.7	116.4	122.1	125.7	129,3	132,9	136.6	140,2	158.3	169.6	180,9

Source: UBA (2023)

For international oil, natural gas and hard coal prices, price paths have been assumed (Table B3), which differ from the information provided by the European Commission (EC 2022): For the period up to the middle of the decade, price projections are based on futures that were up to date in autumn 2023. Projections from the World Energy Outlook (WEO) 2023 have been assumed by the International Energy Agency (IEA) for development around 2030 and beyond (Announced Pledges Scenario). For further details, see UBA (2023).

An expert estimate was used for the development of the carbon price in the European Emissions Trading System (EU ETS) for the period up to 2030, unlike EC (2022). For the period from 2030 onwards, the aforementioned assumptions were again adopted by the IEA. For further details, see UBA (2023).

4.1.1. Technology cost developments

In each case, specific technology costs were assumed in the modelling for electricity, decentralised heat generation and car technologies.

The assumed cost developments of the electricity generation technologies are described in Table B4 (costs at the time of commissioning). Nuclear energy, brown coal and hard coal are not an available option beyond the phase-out path and the costs are not presented. No further cost depression is assumed for natural gas as fossil power generation technologies. On the other hand, in the case of renewable energy, unit investment costs continue to decrease. The cost of storage

technologies is also decreasing, i.e. the cost of batteries in the household sector is falling significantly. No degression of costs is assumed for hydrogen power plants. For electrolyzers, costs are significantly reduced.

Technologies	IN 2021	IN 2022	IN 2023	2019 TO	2025	2026	2027	2028	2029	2030	2035	2040	2050
Natural gas – CCGT	1047	1047	1047	1047	1047	1047	1047	1047	1047	1047	1047	1047	1047
Natural gas – GT	552	552	552	552	552	552	552	552	552	552	552	552	552
Wind on land	1194	1164	1445	1394	1344	1296	1250	1204	1159	1115	909	723	410
Offshore wind	3177	3140	3112	3088	3066	3045	3023	3002	2980	2958	2844	2724	2830
Photovoltaics (open surface plus 957 roof)	765	913	863	826	790	756	722	690	659	516	395	206	
PV battery heater (per kWh)	894	869	843	817	792	766	740	714	689	663	573	484	305

Technologies	IN 2024	IN 2022	IN 2022 TO	2019 TO	2025	2026	2027	2028	2029	2030	2035	2040	2050
Large battery (per kWh)	631	610	588	566	545	523	502	480	458	437	368	337	163
Electrolysers	1376	1301	1227	1152	1078	1003	929	854	779	705	631	558	411
Hydrogen power-plants	1152	1152	1152	1152	1152	1152	1152	1152	1152	1152	1152	1152	1152

Table B4: Evolution of technology costs for electricity generation, Euro2022 per kW

Source: Modelling 2024 projection data, specific investment costs in EUR2022/kW

The assumed cost developments of decentralised heat generation technologies are described in Table B5. They refer to the date of commissioning and are assumed to be constant over time for modelling. The specific investment costs in 2022 (no operating costs) are shown.

Table B5: Technology costs for heat production, Euro2022 per kW

Technologies	
(a) Small buildings (15 kW)	
Gas calorific value	561
Heating oil calorific value	724
Biomass (pellet boiler)	927
Heat pumps – air	2.202
Heat pumps – Sole	2.331
(b) large buildings (50 kW)	
Gas calorific value	246
Heating oil calorific value	223
Biomass (pellet boiler)	1.403
Heat pumps – air	1.627
Heat pumps – Sole	2.139

Source: Modelling projection data 2024

For the transport sector, the imputed costs per car are shown in Table B6. The cost of fossil fuel propulsion of cars increases slightly over time due to energy efficiency improvements. For electric and hybrid propulsion, technology costs are decreasing, mainly driven by the development of batteries. Fossil fuels, as well as hybrids, will not be considered more than one available option in the long term.

Table B6: Evolution of technology costs in the car sector, car cost in EUR thousand, real prices in 2022

TECHNO- logien	IN 2021	IN 2022	IN 2023	2019 TO 2024	2025	2026	2027	2028	2029	2030	2035	2040	2045	2050
Diesel	36	35	35	34	34	35	35	35	36	36	0	0	0	0
Gasoline	30	30	30	30	30	30	31	31	31	32	0	0	0	0
Electro	43	44	42	38	36	35	34	34	33	32	33	32	31	31
Plug-inhybrid	36	36	35	34	34	34	34	34	34	34	0	0	0	0
Hydrogen	66	64	62	58	56	54	53	51	50	48	46	42	41	40

Source Modelling projection data 2024

4.2. Decarbonisation dimension

4.2.1. GHG emissions and removals

4.2.1.1. Trends in current GHG emissions and removals in the sectors of the EU ETS, the EU Climate Change Regulation and LULUCF, as well as in various energy sectors

The annual greenhouse gas emissions for the period 2010 to 2023 are shown in Table B7. The values and sector delineation are taken from the GHG inventory (UBA 2024). LULUCF and international aviation and maritime emissions are not included in the total in accordance with international conventions. In 2023, a total of 674 million tonnes of CO₂ eq were emitted. This represents a 46 % reduction compared to the base year 1990.

Table B7: Greenhouse gas emissions by sector for the years 2010 to 2023, in MtCO₂eq

	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	IN 2020	IN 2021	IN 2022	IN 2023
Energy-related emissions	796	772	785	802	761	771	765	748	724	674	614	642	639	569
Energy	358	354	365	370	350	338	335	315	302	252	214	241	252	201
Manufacturing	123	120	118	118	117	125	127	129	124	121	119	125	116	108
Traffic	152	154	152	156	155	163	165	166	167	166	147	145	149	147
Other*	151	133	138	147	129	134	130	129	124	130	131	127	119	110
Fugitive emissions	12	11	12	11	10	10	9	8	7	5	4	4	4	4
Non-energy emissions	132	133	129	129	130	129	129	132	128	123	117	117	111	105
industrial processes	62	63	60	60	61	60	61	65	62	59	55	57	52	47
Agriculture	58	58	59	59	60	61	60	59	58	57	56	54	53	52
Waste	12	11	10	10	9	8	8	8	7	7	6	6	6	6
Overall	928	904	914	931	891	899	895	880	852	797	732	760	750	674
For information: LULUCF	—1	—8	—16	—14	—6	—8	—10	—6	1	—2	6	3	4	4
Copies to: International aviation and maritime transport	33	32	33	33	32	32	35	36	35	34	17	22	31	32

Other *) are households, industry, commerce and services, including military

Source: Greenhouse gas inventory, UBA (2024)

Annual greenhouse gas emissions include emissions in the sectors covered by the European Emissions Trading Scheme (ETS) and emissions in the EU's Effort Sharing Regulation (ESR) or its predecessor Effort Sharing Decision (ESD for the period 2013-2020) (Table B8).

Table B8: Greenhouse gas emissions under ETS and non-ETS for the years 2010 to 2022, in MtCO₂eq

	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	IN 2022
ETS emissions excluding international aviation	480	475	476	481	461	456	453	438	423	363	321	354	354
ESD emissions 2013 – 2020 ESR emissions 2021 – 2022				460	437	444	454	467	434	444	407	403	395

Sources: ETS emissions: DEHSt (VET 2022 reports), ESD: Emissions:

Emissions from European aviation are indeed subject to emissions trading. They are not shown here because the achievement of national targets only takes into account domestic air transport. Data for 2023 are not yet available. The emissions of the Effort sharing sector are the total emissions (excluding LULUCF) minus ETS and CO₂ emissions from national aviation, and for ESD emissions minus NF₃ emissions. 4.2.1.ii. Projections of sector-specific developments with current national and Union policies and measures until at least 2040 (including for 2030)

The results by sector on the projections for reference developments are described in Table B9. Total GHG emissions excluding international transport and LULUCF are reduced to around 455 MtCO₂eq by 2030. This represents a reduction of almost 64 % compared to 1990.

Table B9: Greenhouse gas emissions by sector for the years 2024 to 2050 in MtCO₂eq

	2019 TO 2024	2025	2026	2027	2028	2029	2030	2035	2040	2045	2050
Energy-related emissions	569	549	503	459	422	393	362	232	140	99	87
Energy	208	197	162	132	111	100	88	57	36	35	39
Industry	101	99	97	94	92	88	84	57	42	34	32

	2019 TO 2024	2025	2026	2027	2028	2029	2030	2035	2040	2045	2050
Traffic	148	145	141	135	128	121	112	68	33	15	6
Other*	109	104	98	93	88	81	75	47	27	13	9
Fugitive emissions	4	4	4	3	3	3	3	2	2	1	1
Non-energy emissions	109	109	105	102	100	96	92	74	70	72	75
Industrial processes	50	50	49	47	44	41	38	25	18	18	18
Agriculture	52	52	52	51	51	51	51	49	49	48	48
LULUCF	0	2	0	0	1	0	—1	—3	0	2	5
Waste	5	5	5	5	4	4	4	4	3	3	3
Total excluding LULUCF	677	655	608	562	522	489	455	309	210	169	157
Total including LULUCF	678	657	608	562	523	489	453	306	209	170	162
Copies to: International air and Seaborne	35	37	38	40	42	42	42	40	40	40	36

* Industry, commerce and services; Households; Agriculture-energy; Military

Source: Modelling projection data 2024, Co-action Scenario (MMS)

In turn, the projections of annual greenhouse gas emissions can be derived from emissions in the ETS sectors and sectors subject to the EU Climate Change Regulation (Effort-Sharing Regulation (ESR)) (Table B10). The conventions apply as described in Table B8.

Table B10: Greenhouse gas emissions in the reference scenario – under ETS and EU Climate Change Regulation for the years 2024 to 2050, in MtCO₂eq

	2019 TO 2024	2025	2026	2027	2028	2029	2030	2035	2040	2045	2050
ETS emissions (stationary)	306	293	254	220	194	179	162	101	63	56	57
ESR emissions	371	361	352	341	327	309	292	208	146	112	100

Source: Modelling projection data 2024, Co-action Scenario (MMS)

Based on the projections of the Reference Scenario, the cumulative emissions over the ESR-relevant total period from 2021 to 2030 are 126 Mt CO₂eq more than planned for Germany under the EU Climate Change Mitigation (ESR). The Federal Government is currently examining the possibilities for implementing further measures (see Chapter 5.1.ii).

4.2.2. Renewable energy

4.2.2.1. Current share of renewable energy in gross final consumption of energy in different sectors (heating and cooling, electricity and transport) and by technologies within these sectors

The shares of renewable energy in energy consumption are shown in Table B11. Between 2010 and 2023, the share of gross final energy consumption increased by more than 10 percentage points to 22 %.

Table B11: Renewable energy – shares of total sectoral consumption for the years 2010 to 2022, in percentages

	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Gross final energy consumption*	11,7	12,5	13,5	13,8	14,4	14,9	14,9	15,5	16,7	17,3	19,1	19,4	20,8	22,0
Gross final energy consumption (national statistics)	11,5	12,5	13,7	13,8	14,4	15,2	15,0	16,1	16,9	17,8	19,5	18,8	20,2	22,1
Electricity*	18,2	20,9	23,6	25,3	28,2	30,9	32,3	34,6	37,6	40,6	44,2	43,9	47,6	51,4
Electricity (national statistics) ¹	17,2	20,6	23,8	25,3	27,5	31,6	31,8	36,2	37,9	42,2	45,5	41,5	46,2	51,8
Onshore wind	6,2	8,1	8,4	8,5	9,6	12,0	11,3	14,6	15,2	17,5	18,8	15,7	18,1	22,5
Offshore wind	0,0	0,1	0,1	0,2	0,2	1,4	2,0	2,9	3,3	4,3	4,9	4,3	4,6	4,5
Photovoltaic	1,9	3,3	4,4	5,0	6,0	6,3	6,3	6,4	7,5	7,8	8,9	8,9	11,0	11,6
Hydropower	3,4	2,9	3,6	3,8	3,3	3,2	3,4	3,3	3,0	3,5	3,4	3,4	3,2	3,7
Biomass	4,9	5,5	6,5	6,9	7,4	7,7	7,8	7,8	7,8	8,0	8,5	8,1	8,4	8,3
Biogenic share of waste	0,8	0,8	0,8	0,9	1,0	1,0	1,0	1,0	1,0	1,0	1,0	1,0	1,0	1,1
Transport*	6,4	6,5	7,3	7,3	6,9	6,6	7,0	7,0	7,9	7,6	10,0	8,0	9,6	10,7
Transport (national statistics)	5,9	5,8	6,1	5,5	5,7	5,2	5,2	5,3	5,5	5,5	7,5	6,8	6,9	7,3
Biodiesel (including HVO and Vegetable oil)	4,0	3,8	4,1	3,5	3,7	3,2	3,2	3,3	3,4	3,4	5,1	4,3	4,2	4,3
Biogenic petrol	1,5	1,5	1,5	1,4	1,5	1,3	1,3	1,3	1,3	1,3	1,4	1,4	1,5	1,5
Biomethane	0,0	0,0	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,2	0,2	0,2

EE – Electricity	0.3	0.4	0.5	0.5	0.5	0.5	0.6	0.7	0.7	0.8	0,9	0,9	1.1	1,3
Heating and cooling*	12,1	12,6	13.4	13.4	13.4	13.4	13,0	13.4	14,2	14.5	14.5	15.5	17.5	18.4
Heating and cooling (national statistics)	12.4	12.8	13.7	13.8	13.8	13.7	13.6	14,0	14.7	14.9	15,0	15.7	17.5	18.8
Biomass and renewable Wastes	11.5	11.6	12.5	12.5	12,3	12.2	12,0	12,3	12.8	12,9	12.8	13.5	14.8	15.6
Other renewable Energies	0,9	1.1	1.2	1.2	1.5	1.5	1.6	1.7	1.9	2.0	2.2	2.2	2.7	3.2

* to 2020 Directive 2009/28/EC, from 2021 Directive 2018/2001

(1) by way of derogation from Directive 2009/28/EC, inter alia, without normalisation of hydropower and wind power and with total electricity generation from biomass.
Other renewable energies include geothermal energy, environmental heat, solar thermal, renewable district heating.

Source: UBA (2024)

Significant differences remain between sectors and areas of application. The electricity sector is the main driver of the increasing share of renewables in gross final energy consumption. By 2023, the share of electricity increased by more than 33 percentage points compared to 2010 to 51.4 %. The share of renewables in the electricity sector has thus increased significantly more than the share in transport (10.7 % in 2023) and in heating and cooling (18.4per cent in 2023). In these two sectors, renewable energy has increased moderately since 2010.

4.2.2.11. Projections of the evolution with current policies and measures for 2030 (with an outlook until 2040)

The continuation of existing instruments assumed in the reference scenario has varying degrees of impact on the use of renewable energy in different sectors. Renewable hydrogen, so-called green hydrogen, can have a relevant impact on the shares of renewable energy in all three sectors. The modelling of the projection data;

In 2024, which is used here in the report, hydrogen imports cover total hydrogen imports. The extent to which these imports originate from renewable energy sources or from other sources was neither established at the beginning nor the result of the modelling. This is the subject of further policy decisions in Germany as part of the hydrogen strategy. However, in order to be able to identify the sectoral and technological renewable shares at this point, calculations were carried out in two variants, covering the entire theoretical range of results. The actual future share will be within this area.

Table B12a describes the evolution when imports of hydrogen and hydrogen derivatives are entirely from renewable energy (100 % green hydrogen) over the entire period.

Under these assumptions, the share of renewables in gross final energy consumption will increase by around 169 percentage points from 2023 onwards to 38.1 % in 2030 (EU statistics). In the following years, the increase continues steadily. Compared to the analysis in the previous draft NECP, electricity consumption is currently expected to increase in 2030, which also results in higher gross

final energy consumption. The target of a 41 % share of renewable energy was clearly exceeded already in 2031. In 2040, this share is 73 %. The Federal Government will monitor the further development of the share of renewable energy in gross final energy consumption and will examine ways to ensure that the 41 % renewable energy target set for 2030 can be met earlier.

Due to national acceleration measures, the roll-out of renewable technologies in the electricity sector is progressing rapidly, especially in wind energy and photovoltaics. This shows the significantly increasing number of approvals for these technologies in 2023 and 2024. The share of renewables in gross electricity consumption increases to 74.2 % by 2030. This is the value according to EU and national statistics. The minor differences in statistics are offset by specific features resulting from the modelling process. The target of 80 % will thereafter be exceeded by 2032 at the latest. By 2040, the share of renewables in the electricity sector will increase to 96 %.

Table B12a: Renewable energy – shares of total sectoral consumption for the Years 2024 to 2050, % – assuming only green hydrogen imports

	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2040	2045	2050
Gross final energy consumption (RED II)	23.5	25.4	27.5	29.6	31.8	34.8	38.1	41.6	45.4	49.4	53.5	57.5	73.0	81.9	88.3					
Gross final energy consumption (national statistics)	23.6	25.5	27.5	29.7	31.8	34.8	38,0	41.4	45.2	49.2	53.1	57.0	71.9	80.1	86.1					
Electricity (Red II and national statistics)	54.5	57.8	61,9	64,7	66.8	69.9	74.2	78.4	81,9	85.1	87.8	89.6	96.0	95.7	94,5					
Wind on land	21.4	22.1	23.2	24,0	24.6	25.3	26.2	27.1	28.3	29.6	30,7	31.8	33.9	32.5	32.3					
Offshore wind	5,6	6.3	7.2	7.7	8.1	9.3	12,1	14,2	15.3	16.2	16.7	16.8	16.7	19.2	19.4					
Photovoltaic	15.3	18,0	20,7	23,0	25,0	26,9	28.6	30.3	31.9	33.3	34.5	35.5	40.4	38.8	37.4					
Hydropower	3.7	3.6	3.5	3.4	3.2	3.1	2,9	2.8	2.7	2.6	2,5	2.4	2.1	2.0	1.9					
Biomass (including biogenic part of the Waste)	8.4	7.8	7.2	6.6	5.8	5.1	4.4	3.9	3.7	3.5	3.3	3.2	2.9	3.1	3.4					
Geothermal	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,0	0,0	0,0					
Imported greener Hydrogen	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0					
Transport (RED II)	10.2	12.8	15.8	20,3	26,0	31.8	38,0	44,6	51.6	58.6	65.4	71.8	92.7	101.4	108.5					
Transport (national statistics)	6.6	7,6	8,6	10.3	12.2	14,2	16.8	19.8	23,0	26.8	31.1	35.8	57.1	68.6	82.9					
Biodiesel (including HVO and vegetable oil)	3.5	3.6	3.6	3.7	3.9	3.4	3.5	3.2	3.0	2.8	2,5	2.3	1.1	1.0	0.8					
Biogenic petrol	1.2	1,3	1.4	1.5	1.6	1.7	1.8	1.8	1.7	1.6	1.6	1.4	0.8	1.1	1,3					
Biogases	0,1	0,1	0,1	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0					
Renewable electricity	1.7	2.3	3.0	4,0	5.2	6,9	9.2	11,7	14.5	17.5	20.6	23.7	39.0	49.1	54.3					
Green hydrogen/e-fuels	0,0	0,1	0.2	0.6	1.0	1,3	1.4	1.4	1.4	2,5	4,0	5.8	12,7	12.8	18.4					
Heating and cooling (Eurostat and national statistics)	20.2	21.7	23.2	24.6	26.1	28.4	30.2	32,0	35.1	38.4	41.7	45.4	57.0	67.6	70.8					
Biomass and renewable Wastes	14.9	15.7	16.4	17.2	17.7	19,0	19.4	19,9	20.6	21.4	22.2	23.6	27.2	31.1	32.7					
Other renewable Energies	5.2	6,0	6,7	7.3	8,0	8,9	9,9	10,9	12,1	13.4	14.7	15,9	21.4	25.3	26.6					
Hydrogen	0,0	0,0	0,0	0.2	0.3	0.5	0,9	1,3	2.4	3.6	4.8	5,9	8.4	11.2	11.4					

Other renewable energies include geothermal energy, environmental heat, solar thermal, renewable district heating.

Important: Deviations of totals due to rounding differences. Multiple counting in transport under the Renewable Energy Directive can lead to calculated renewable shares above 100 %.

Source: Modelling projection data 2024, Co-action Scenario (MMS)

In the transport sector, according to EU statistics, the share of renewable energy is rising rapidly to

38 % by 2030, due to the multiple calculations of individual technologies enshrined therein. National statistics also show a significant increase to just under 17 %.

This development is mainly driven by the increasing share of renewable electricity used for electro-mobility. The share of biogenic fuels is developing slowly and is decreasing markedly towards mid-2030. Green hydrogen/e-fuels are slowly gaining importance at the end of the decade, especially in air-sea and inland waterway transport, but overall lag behind electro-mobility.

With regard to the scope of heating and cooling, differences between EU and national statistics are also compensated for by specific features resulting from the rounding process and therefore a simpler assumption is made of the identity of the statistical values. By 2030, the share of renewable energy will increase by almost 12 percentagepoints to over 30 %. The share is thus significantly above the existing binding target of 23.5 % for 2030. The share of biomass and renewable waste is steadily increasing over time. However, as early as the 2020s, other renewable energies, i.e. geothermal energy, environmental heat, solar thermal and renewable district heating, have become increasingly important.

Table B12b describes the development of the opposite assumption that imports of hydrogen and hydrogen derivatives come entirely from sources other than renewables (0 % green hydrogen). Consequently, renewable energy shares are lower here than when assuming hydrogen imports from fully renewable energysources.

Table B12b: Renewable energy shares in total sectoral consumption for the years 2024 to 2050, as a percentage – assuming hydrogen imports from non-renewable sources only

	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2040	2045	2050	
Gross final energy consumption	23.5	25.4	27.5	29.5	31.6	34.5	37.8	41.3	44.8	48.2	51.4	54.5	67.1	75.5	79.7	
Total gross final energy consumption (national statistics)	23.6	25.5	27.5	29.5	31.6	34.5	37.7	41.2	44.6	48.0	51.0	54.1	66.3	74.0	77.9	
Electricity (Eurostat and national Statistics)	54.5	57.8	61.9	64.7	66.8	69.9	74.2	78.4	81.9	85.1	87.8	89.6	96.0	95.7	94.5	
Wind on land	21.4	22.1	23.2	24.0	24.6	25.3	26.2	27.1	28.3	29.6	30.7	31.8	33.9	32.5	32.3	
Offshore wind	5,6	6.3	7.2	7.7	8.1	9.3	12,1	14,2	15.3	16.2	16.7	16.8	16.7	19.2	19.4	
Photovoltaic	15.3	18,0	20,7	23,0	25,0	26,9	28.6	30.3	31.9	33.3	34.5	35.5	40.4	38.8	37.4	
Hydropower	3.7	3.6	3.5	3.4	3.2	3.1	2,9	2.8	2.7	2.6	2,5	2.4	2.1	2.0	1.9	
Biomass (including biogenic part of the Waste)	8.4	7.8	7.2	6.6	5.8	5.1	4.4	3.9	3.7	3.5	3.3	3.2	2,9	3.1	3.4	
Geothermal	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,0	0,0	0,0	
Imported greener Hydrogen	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	
Transport (RED II)	10.2	12.8	15.8	19,9	25.2	30,7	36.9	43.6	50.6	57.1	63.1	68.7	87.4	96.4	101,0	
Transport (national statistics)	6.6	7,6	8,6	9,9	11.4	13.2	15.7	18.7	21,9	25,0	28.2	31.5	47.6	58.1	66.3	
Biodiesel (including HVO and vegetable oil)	3.5	3.6	3.6	3.7	3.9	3.4	3.5	3.2	3.0	2.8	2.5	2.3	1.1	1.0	0.8	
Biogenic petrol	1.2	1,3	1.4	1.5	1.6	1.7	1.8	1.8	1.7	1.6	1.6	1.4	0.8	1.1	1,3	
Biogases	0,1	0,1	0,1	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	
Renewable electricity	1.7	2.3	3.0	4,0	5.2	6,9	9.2	11,7	14.5	17.5	20.6	23.7	39.0	49.1	54.3	
Green hydrogen/e-fuels	0,0	0,1	0.2	0.2	0.2	0.3	0.3	0.3	0.4	0.6	1.1	1.6	3.2	2.3	1.7	
Heating and cooling (Eurostat and national statistics)	20.2	21.7	23.2	24.6	26.1	28.6	30.5	32.4	34.9	37.4	39.7	42.5	53.0	63.7	69.1	
Biomass and renewable Wastes	14.9	15.7	16.4	17.2	17.7	19,0	19.4	19,9	20.6	21.4	22.2	23.6	27.2	31.1	32.7	
Other renewable Energies	5.2	6,0	6,7	7.3	8,0	8,9	9,9	10,9	12,1	13.4	14.7	15,9	21.4	25.3	26.6	
Green hydrogen	0,0	0,0	0,0	0.2	0.4	0.7	1.2	1.7	2.2	2.6	2.8	3.0	4.4	7.3	9.8	

*) Other renewable energies are geothermal, environmental heat; Solar thermal, renewable district heating

Important: Deviations of totals due to rounding differences.

Multiple counting in transport under the Renewable Energy Directive can lead to calculated renewable shares above 100 %.

Source: Modelling projection data 2024, Co-action Scenario (MMS)

By comparison with Tables B12a and B12b, differences in the renewable shares do not arise until 2027, when imported hydrogen is used to a significant extent. At the technological level, only

hydrogen applications differ accordingly. At the sector level, transport and heating and cooling are concerned. These differences to assume fully green hydrogen imports are initially in the low range of well below one percentage point and rise to just under 5 % point for transport by 2040, and more than 4 percentage points for heating and cooling.

Looking at both tables as a whole, the share of renewable energy in gross final energy consumption by EU statistics in 2030 ranges from 37.8 % to 38.1 %. (From 37.7 % to 38.0 % according to national statistics)

The share of renewable energy in the electricity sector is 74.2 % in both cases in 2030. The share of renewable energy in transport varies from 36.9 % to 38 % according to EU statistics in 2030 (from 15.7 % to 16.8 % according to national statistics). The share of renewables in heating and cooling is in a narrow range of 30.2 to 30.5 % in 2030.

4.3. Energy efficiency

4.3.1. Current primary and final energy consumption in the economy and per sector (including industry, residential, service and transport)

Between 2008 and 2023, primary energy consumption decreased by 25.3 %. Between 2010 and 2023, the decrease was 24 %. Final energy consumption decreased by 12.4 % between 2008 and 2023 and final energy consumption fell by 12.5 % between 2010 and 2023 (Table B13).

The different end-use sectors have experienced different levels of decreases in consumption since 2010. In industry (other mining and manufacturing), consumption fell by 14.6 % between 2010 and 2023, and by 26 % for industry, commerce and services (GHD). For households, the decline was 13.7 %. In comparison, the consumption of the transport sector decreased by only 0.8 %.

Table B13: Primary energy consumption (PEC), final energy consumption (FEC) as a whole and by sector, 2008 and 2010 to 2023, in PJ

	2008	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	IN 2020	IN 2021	IN 2022	2023*
PEV	14.370	14.126	13.515	13.615	13.897	13.232	13.368	13.494	13.516	13.178	12.808	11.887	12.443	11.675	10.735
EEV	9.327	9.334	8.968	9.049	9.242	8.749	9.014	9.088	9.171	9.058	9.050	8.471	8.789	8.517	8.168
Industry ¹	2.573	2.595	2.666	2.613	2.589	2.562	2.573	2.673	2.657	2.629	2.537	2.432	2.607	2.392	2.217
Traffic	2.622	2.516	2.523	2.529	2.578	2.554	2.647	2.704	2.757	2.776	2.757	2.325	2.348	2.519	2.496
Households	2.617	2.681	2.343	2.508	2.616	2.249	2.348	2.410	2.407	2.401	2.492	2.484	2.584	2.424	2.314

GHD² 1.515 1.542 1.436 1.399 1.458 1.386 1.446 1.337 1.349 1.252 1.264 1.231 1.251 1.182 1.141

(1) Other mining and manufacturing

(2) Industry, commerce, services

*Data for 2 023 are provisional

Source: BMWK (2024)

4.3.11. Current potential for the application of high-efficiency cogeneration and efficient district heating and cooling

Heating and cooling networks play a central role in the transition to climate-neutral heating and cooling. Their importance and scope will increase in the future. On the other hand, the importance of mostly fossil-based cogeneration for the provision of district heating and cooling will decrease in the future. The development of cogeneration heat production in the reference scenario is shown in Table B14.

Table B14: Heat production in CHP plants by 2050, in TWh

	2019 TO 2024	2025	2026	2027	2028	2029	2030	2035	2040	2045	2050
Lignite	10.5	9.2	8,9	8.3	7,9	6.3	1.1	0,0	0,0 ¹	0,0	0,0 ¹
Coal	17.6	13.2	11.8	10.8	9,1	7.4	2.2	0,0	0,0	0,0	0,0
Gas	102.3	107.4	107.3	106,5	104.5	100,8	102.2	70.6	33.8	17.1	16.2
Petroleum	6.2	6,4	6.2	6.3	6.3	6.3	6.5	5.0	2.8	1.5	1.1
Biomass ^a	52.6	53.7	53,5	51,0	48,0	44,7	40.0	35.6	33.4	33,5	43.6
Others	15,9	15.6	15.3	14.8	14,2	13.6	13,0	11.5	10,1	9.4	9.2
Hydrogen	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
Overall	205,2	205,4	203.1	197,6	190,0	179.3	165,0	122.7	80.2	61.5	70.1

Source: Modelling projection data 2024, Co-action Scenario (MMS)

In response to Russia’s war of aggression in Ukraine and the resulting shortage of fossil imports, the share of renewable energy and waste heat in heating and cooling networks is expected to increase significantly in Germany. This is based, inter alia, on the EU requirements under the EED and the RED.

The share of renewable energy and waste heat in district heating in Germany was around 23 % in 2020 and around 25 % in 2022. It is expected to rise to 50 % by 2030. By 2045, heating and cooling networks must be fully decarbonised. The legal basis was established by the Law on Heat Planning and Decarbonisation of Heat Networks, which entered into force on 1 January 2024. Both renewable energy and unavoidable waste heat can be used to decarbonise. The law sets an

indicative target for 2030 of a national average of 50 % renewable energy or unavoidable waste heat. The law includes a binding decarbonisation pathway whereby a minimum share of 30 % in 2030 and a minimum share of 80 % of renewable energy in 2040; or

unavoidable waste heat must be achieved. A minimum share of 65 % renewable energy or unavoidable waste heat is foreseen for new heat networks at the time of commissioning.

4.3.111. Projections taking into account the current energy efficiency policies, measures and programmes described in point 1.2.ii for primary and final energy consumption for each sector at least until 2040 (including for 2030)

The evolution of primary energy consumption and final energy consumption in the reference scenario is shown in Table B15. According to these figures, primary energy consumption will decrease by 29.4 % by 2030 compared to 2008 and by 37.9 % by 2040. Over the same period, final energy consumption decreases by 15.5 % and 27.5 % respectively (Table 15).

Table B15: Primary energy consumption (PEV), final energy consumption (FEC) – total and by sector for the years 2024 to 2050, in PJ

		2025	2026	2027	2028	2029	2030		2040	2045	2050
PEV	11.005	10.916	10.729	10.581	10.486	10.325	10.148	9.410	8.925	8.799	8.843
EEV	8.316	8.294	8.256	8.214	8.147	8.020	7.883	7.247	6.767	6.463	6.366
Industry ¹	2.285	2.329	2.365	2.402	2.424	2.402	2.385	2.325	2.312	2.303	2.373
Traffic	2.572	2.582	2.582	2.568	2.546	2.496	2.437	2.142	1.926	1.834	1.795
Households	2.312	2.272	2.231	2.192	2.149	2.118	2.082	1.896	1.740	1.613	1.532
GHD ²	1.147	1.111	1.078	1.053	1.028	1.004	979	884	789	713	666

1 other mining and manufacturing;

2 Industry, commerce, services

Source: Modelling projection data 2024, Co-action Scenario (MMS)

The biggest decline in final energy consumption is in the industrial, commercial and services sectors and households, with more than 35 % and just under 21 % by 2030 (compared to 2008). Total final energy consumption in industry and transport is also declining and by 7 % by 2030.

The figures shown in Table B15 are based on calculation methods by the German Working Group on Energy Balance. However, some of these differ from Eurostat's methodology for calculating energy efficiency targets (see chapter 2.2)³. Based on Eurostat methodologies and on the basis of the MMS, primary final energy consumption is reduced by around 32.5 % by 2030 compared to 2008 levels, to 9 000 PJ and 2 500 TWh respectively. On the basis of Eurostat methods and MMS,

³Differences concern, for example, the inclusion of maritime transport (high-sea bunkerings) and non-energy consumption in the PEV or environmental heat in the EEV.

final energy consumption is reduced by about 16.5 % by 2030 compared to 2008 levels to 7 517 PJ and 2 088 TWh respectively.

4.3.1. . Cost-optimal levels of minimum energy performance requirements resulting from national calculations, in accordance with Article 5 of Directive 2010/31/EU

Studies on cost-optimal levels of minimum energy performance requirements in buildings have been updated. It is clear that the requirements for new construction and existing buildings in Germany are in principle cost-optimal and that there is no urgent need for action, but there may be future adjustments.

4.4. Security of energy supply

4.4.1. Current energy mix, domestic energy resources, import dependency, including relevant risks

The current energy supply in Germany continues to be dominated by the consumption of fossil fuels. For example, in 2023, slightly less than 80 % of the

Primary energy consumption on mineral oil, gases and coal sources (Table B16). The share of renewable energy has risen to almost 20 %.

Table B16: Primary energy consumption by energy source for the years 2010 to 2023, in PJ

	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	IN 2020	IN 2021	IN 2022	2023*
Coal	1.714	1.715	1.725	1.840	1.759	1.729	1.693	1.502	1.428	1.084	896	1.112	1.142	931
Lignite	1.512	1.564	1.645	1.629	1.574	1.565	1.511	1.507	1.481	1.163	958	1.127	1.168	895
Mineral oils	4.689	4.539	4.552	4.638	4.509	4.585	4.581	4.684	4.478	4.520	4.080	4.042	4.102	3.822
Gases	3.183	2.923	2.934	3.074	2.672	2.781	3.068	3.167	3.098	3.220	3.145	3.310	2.721	2.655
Nuclear	1.533	1.178	1.085	1.061	1.060	1.001	923	833	829	819	702	754	379	79
Renewable energy	1.310	1.365	1.524	1.571	1.568	1.672	1.677	1.790	1.825	1.903	1.970	1.949	2.044	2.107
Other energy-carriers	239	244	225	201	213	210	223	222	214	216	204	215	218	204
External-tradebalance Electrical energy	—54	—14	—74	—116	—122	—174	—182	—189	—175	—118	—68	—67	—98	42
Overall	14.126	13.515	13.615	13.897	13.232	13.368	13.494	13.516	13.178	12.808	11.887	12.443	11.675	10.735

*) Figures for 2 023 are provisional.

Only fossil gases. Biogas is listed under renewable energy. Net exports of electricity are weighted with negative signs.

Source: BMWK (2024)

Table B17 shows the percentages of net imports as imports minus exports and stock changes in relation to actual primary energy consumption. Mathematical values above 100 % for 2 022 are due to stock restocking, which had just increased in the wake of Russia's war of aggression against Ukraine and the related energy crisis.

The indicator on import dependency, considered in isolation, has only limited relevance and is not suitable as the only target and control measure. As an open economy, Germany is also strongly involved in international energy markets and can thus benefit, among other things, from cheap energy imports. It is important to minimise security of supply risks through diversification measures.

The import dependency of the energy mix is mainly due to the high consumption of fossil fuels, the vast majority of which are imported. One exception is lignite, which is wholly domestically extracted and even exported under-exported. At the end of 2018, subsidies for the sale of domestic hard coal

were stopped. As of 2019, the import share of hard coal will thus increase to 100 %. The security of supply of imported coal is estimated to be high due to the liquid world market and the international supply structures. Between 2010 and 2021, the importance of the countries of the former Soviet Union for the import of hard coal into Germany has steadily increased, reaching around 50 % in 2021. Together with three other countries, the USA (17 %), Australia (13 %) and Colombia (6 per cent), these countries accounted for more than 80 % of imports of hard coal into Germany.

Following the entry into force of the EU coal embargo on Russian exports on 11 August 2022, existing German coal imports had to be replaced in the short term. Consequently, Russia's share of hard coal imports decreased to 2 % in 2023 and was replaced mainly by deliveries from the US (29 per cent), Australia (26 %) and Colombia (15 %) and South Africa (11 per cent).

Table B17: Import dependency for the years 2010 to 2023, net imports as a percentage

	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	IN 2020	IN 2021	IN 2022	IN 2023
Coal	77.0	81.6	80.3	86.8	87.3	88.4	94.8	91,9	88.3	105.5	92.9	97.7	103.2	95.9
Lignite	—1,6	—1,8	—1,9	—1,9	—2.7	—2.6	—1,9	—2,1	—2,2	—2.4	—2,3	—2,3	—2,2	—2,3
Mineral oils	97.8	96.3	98.3	97.6	97.8	98.7	98.0	97.0	97.2	99.1	98.5	96.7	98.9	97.1
Gases	81,3	86.7	85.6	86.8	89.1	88.6	90.2	91.3	95.6	98.6	88.7	88.8	106.3	93.3
Nuclear	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
Renewable energy	—0.6	0,0	0.5	—0.8	—1.7	—1.4	—1,4	—1,3	0.3	—0.8	1.2	—0,2	0,0	—0.1
Overall	59,0	60,6	61.3	62.4	61.6	61,7	63.8	63.3	63.6	67.4	63.7	63,0	68.6	66.2

The percentages of net imports are imports minus exports and bunkers) in relation to primary energy consumption. Mathematical values above 100 % are due to stock restocking. Nuclear energy is considered as domestic primary energy according to Eurostat's definition

Source: BMWK (2024)

Although gas consumption decreased significantly since 2010 (Table B16), domestic production decreased significantly over the same period. Overall, the import share of gases increased significantly. In 2023, Germany imported around 93 % of its natural gas needs. In 2023, Germany sourced its gas imports mainly from the three countries Norway, the Netherlands and Belgium or landed LNG imports in these countries. The Federal Network Agency collects these figures as well as transit volumes as part of its monitoring report.

Mineral oils are almost entirely imported. Germany's largest share of its mineral oil imports in 2023 was from the US and Norway, with around 18 % each, followed by Libya and Kazakhstan each accounting for just over 11 % and the United Kingdom (10 %). The share of OPEC member countries was around 28 %.

4.4.11. Projections of development with existing policies and measures at least until 2040

(including for the year 2030)

In the reference projection, primary energy consumption decreases between 2024 and 2030 including 860 PJ (Table B18). The decline in primary energy consumption for fossil fuels is driven mainly by the increasing use of renewable energy in the buildings and electricity sectors, the reduced conversion of wind, PV and electromobility losses, and the decrease in coal and oil consumption. In electricity generation, the shares of coal and lignite are significantly decreasing, mainly due to the long-term increase in CO₂ prices in the ETS. Electricity generation from natural gas also continues to decline from around the middle of the decade. The use of domestic nuclear energy will be completely phased out with the phase-out of nuclear energy as of 2023. Renewable energy consumption is growing significantly, by 53 % by 2030 compared to 2023, and continues to grow at lower rates in the decades thereafter.

Table B18: Primary energy consumption – by energy carrier 2024 to 2050, in PJ

	2019 TO 2024	2025	2026	2027	2028	2029	2030	2035	2040	2045	2050
Coal	703	622	544	431	371	320	244	86	40	18	16
Lignite	885	811	486	257	115	80	45	25	20	18	15
Mineral oils	4.095	4.069	4.060	4.012	3.954	3.800	3.632	2.747	2.051	1.738	1.447
Gases	2.813	2.780	2.833	2.852	2.779	2.627	2.513	1.716	1.143	858	868
Nuclear energy ⁸	0	0	0	0	0	0	0	0	0	0	0
Renewable energy	2.244	2.385	2.537	2.684	2.839	3.046	3.275	4.359	5.115	5.529	5.750
Other energy sources	246	256	265	286	311	332	349	612	775	820	910
External trade —balance electric energy*	19	—9	3	59	118	121	92	—133	—219	—181	—163
Overall	11.005	10.916	10.729	10.581	10.486	10.325	10.148	9.410	8.925	8.799	8.843

* including small shares of district heating

Source: Modelling projection data 2024, Co-action Scenario (MMS)

According to the model results, the use of hard coal will decrease to 86 PJ by 2035. This represents a decrease of 95 % compared to 2010. After 2035, coal use continues to decline. The remaining amount of hard coal after 2040 is mostly material use, in particular for the production of metals and basic chemicals. In all these energy sources, very small quantities are also present in a wide range of sub-sectors. The model results are due to the simulation methodology, which leaves niches open to reflect the heterogeneity of industrial applications and locations (e.g. lack of natural gas connection and underperformance of a grid connection). This will always leave a small balance in modelling in this form as long as tools are not modelled to fully limit the availability of certain raw materials.

The lignite phase-out in North Rhine-Westphalia will already take place by 2030 and the overall use of lignite will decrease to 25 PJ by 2035. This represents a decrease of 98 % compared to 2010. After 2035, the use of lignite in the model continues to decline to 15 PJ. For such a small quantity, the coal phase-out date can be assumed from that date at the latest.

The remaining small use of lignite in the model relates almost exclusively to use in cement production. This amount decreases significantly over time. Model results slow down the transformation in this area from around 2035, but remain at a very low level.

The reference projection shows that import dependency decreases from 67.4 % in 2024 to 65.5 % in 2030 with the switch from imported conventional energy to renewable energy. The degree of dependency decreases significantly in subsequent years to below 40 % in the year after 2040 (Table B19). While the share of domestic energy sources tends to decrease as a result of the decline in indigenous lignite use and the phasing out of nuclear energy, the increasing share of domestic renewables dominates the overall development. The import shares for renewables relate mainly to imports of biomass.

Table B19: Import dependency – net imports for 2024 to 2050, %

Carrier	2019 TO 2024	2025	2026	2027	2028	2029	2030	2035	2040	2045	2050
Coal	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Lignite	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
Mineral oils	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Gases	89,9	90.4	91.3	92,0	92.5	92.5	92.7	94.6	99.4	100.0	100.0
Nuclear	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Renewable energy	8,7	10,1	10.8	11.3	11.4	11,9	11,0	8.1	7,0	8,7	11,1
Overall	67.4	67.0	68,5	69.3	69.3	67.7	65.5	52.8	43.1	39.2	38.7

The percentages of net imports are imports minus exports and bunkers) in relation to primary energy consumption.

It is also assumed that there will no longer be exports of lignite as of 2023 (but historically this is also very small).

Nuclear energy is considered as domestic primary energy according to Eurostat's definition. The use of nuclear energy for electricity production therefore does not increase import dependency. The energy mix of German electricity imports reflects the energy mixes of the surrounding (Member) States from which Germany purchases electricity. This source of electricity contains different shares of electricity from renewable sources (wind, solar, hydropower, bioenergy) and from conventional energy sources (in particular coal, natural gas and nuclear energy), depending on the market situation. The latter may change proportionally due to reduction pathways in some neighbouring countries.

The potential import demand for biomass fuels results from the projected consumption of biomass fuels

minus the sum of the projected biomass fuel supply in agriculture and forestry and the estimation of biomass fuels from biogenic residual and waste raw materials (see 2023 Projection Report, Chapter 3.4.2).

Source: Modelling projection data 2024, Co-action Scenario (MMS)

4.5. Internal energy market

4.5.1. Electricity interconnectivity

4.5.1.1. Current interconnection level and main interconnectors

The development of electricity trading capacities in the European network interconnection assumed for quantitative analysis is guided in the long term by the Ten-Year Network Development Plan (TYNDP 2022). The assumptions are presented in Table B20.

Table B20: Average available trade capacity for Germany and its electrical neighbours, 2020 to 2050, in MW

Export (from DE to ...)	AT	BE	CH	CZ	DK	FRI	NL	NO	PL	SE	UK	Sum
IN 2020	5000	0	800	2150	1600	2850	1468	0	400	615	0	14883
2025	5000	500	800	2150	1600	2850	1468	1400	400	615	0	16783
2030	6000	500	3273	2150	3100	2880	2500	1400	1000	2015	1400	26218
2035	6400	550	3273	2150	3100	2880	2750	1400	1375	2015	1400	27293
2040	6800	600	3273	2150	3100	2880	3000	1400	1750	2015	1400	28368
2045	6800	600	3273	2150	3100	2880	3000	1400	1750	2015	1400	28368
2050	6800	600	3273	2150	3100	2880	3000	1400	1750	2015	1400	28368

Import (from... to DE)	AT	BE	CH	CZ	DK	FRI	NL	NO	PL	SE	UK	Sum
IN 2020	5000	0	4000	3750	585	1500	553	0	1050	615	0	17053
2025	5000	500	4000	3750	2385	1500	553	1400	1050	615	0	20753
2030	6000	500	4165	3750	2543	2880	2500	1400	1500	2015	1400	28653
2035	6400	550	4165	3750	2797	2880	2750	1400	1875	2015	1400	29982
2040	6800	600	4165	3750	3051	2880	3000	1400	2250	2015	1400	31311
2045	6800	600	4165	3750	3051	2880	3000	1400	2250	2015	1400	31311
2050	6800	600	4165	3750	3051	2880	3000	1400	2250	2015	1400	31311

Source: ENTSO-E TYNDP 2022 Global Ambitions scenario and additional own assumptions based on research in TSO project projections.

4.5.1.11. Projections of interconnector expansion requirements (including for the year 2030)

The Network Development Plan (NEP) reviews, on a biennial basis, the requirements for the development of transmission networks resulting from the development of the domestic production and consumption structure and from the European internal energy market. The results of the NEP are published [HYPERLINK "http://www.netzentwicklungsplan.de/"](http://www.netzentwicklungsplan.de/) [on www.netzentwicklungsplan.de](http://www.netzentwicklungsplan.de) and are used in their latest version for the quantitative analysis for the National Energy and Climate Plan.

4.5.2. Energy transmission infrastructure

4.5.2.1. Key features of the existing transmission infrastructure for electricity and gas and of the future hydrogen transmission infrastructure

Electricity

According to TSOs, the German electricity transmission system currently comprises around 38.5000 km of high voltage lines (220/380 kV). See Chapter 3.4.1. for further details on electricity infrastructure.

Gas

Germany has a modern and robustly upgraded gas transport infrastructure with a large gas pipeline network of a total length of 613.605 km (year 2022, BDEW May 2023); including 130.393 km of low-pressure network, 182.624 km of medium-pressure network, 126.766 km of high-pressure network and 173.822 km of domestic connections. The network of Transmission System Operators (TSOs) has more than 110 compressor stations and is connected to neighbouring countries' gas networks through more than 25 BCPS. The German gas transmission system is divided into a high-calorific gas (H-gas) and low-calorific (L-gas) area.

Network development measures to optimise and reinforce the network according to needs, to develop the network according to needs and to ensure security of supply are included in the network development plan for gas. This must be prepared by the transmission system operators (see chapter 3.4.2.i. and below).

Hydrogen

Germany plans a fast and cost-effective deployment of hydrogen network infrastructure in two stages. The legal framework for the hydrogen core network became the first stage with the Law on adapting the law on energybusiness to EU law and amending further energy legislation, which was adopted on 29 September. Entered into force on December 2023. The transmission system-operators submitted a joint application for the core network to the Federal Network Agency in July 2024. The application foresees the construction of a core network of approximately 9.700 km to provide an over-regio link between ports, industry, storages and power by the target year 2032. In the second stage, the hydrogen core network will then be further developed on a demand-driven basis as part of the rotating integrated network development for gas and hydrogen.

4.5.2.11. Projections of network expansion requirements at least until 2040 (including for the year 2030)

Electricity

Please refer to the comments in Chapters 2.4.2 and 3.4.1 with regard to the extension of the electricity network.

Gas

Details of the current gas network development plan will be provided by the Federal Government in the forthcoming final NECP update.

4.5.3. Electricity and gas markets, energy prices

4.5.3.1. Current situation of electricity and gas markets, including energy prices

As of September 2021, the day-ahead wholesale electricity price had already increased. This trend continued at the turn of 2021/2022 and intensified with Russia's attack on Ukraine. Since then, gas and coal prices have also risen significantly. However, since 2023, both gas prices and wholesale electricity prices have decreased.

The evolution of electricity prices is very volatile and closely correlated with the evolution of gas prices, as gas-fired power plants set the price in the electricity market in many hours. The development of gas prices, in turn, depended heavily on the development of the Ukraine crisis and the respective escalation steps on the Russian side to supply gas to Germany and Europe (BNetzA 2023). Notably in mid-2022, maximum wholesale electricity prices were achieved. Since then, the wholesale electricity price has tended to decline until 2024. However, prices remain above pre-2021 levels.

According to analyses by BDEW (2024), consumer electricity prices show a significant increase from 2021 onwards, which continues into 2023. In spite of a decline in government-driven price components, in particular the abolition of the EEG surcharge, the increase in the cost of procurement dominated the consumer price. The current decline in wholesale prices is leading to a slight reversal of the trend in procurement costs. The average price of electricity for small to medium-sized industrial enterprises (excluding electricity tax) for new entrants has recently fallen significantly again. In the current annual average, the electricity price for small to medium-sized industries has more than halved compared to the peaks in the second half of 2022. For some companies that previously paid the EEG surcharge, electricity prices are at the 2017 level.

Consumer prices for natural gas reflect the described trend in the purchase costs. After the sharp increases in the second half of 2022, there is on average a decrease in price levels in 2023 and 2024, which however does not compensate for price increases since 2021 (cf. BDEW 2024).

4.5.3.11. Projections of development with existing policies and measures at least until 2040 (including for the year 2030)

Table B21 describes the results on price projections for the reference scenario examined. The retail prices of natural gas and electricity are subject to levies, levies and charges. These price components refinance, for example, grid infrastructure and the development of renewable energies. For reasons of climate protection, energy and not least distribution policy, however, other ways of reflection are also conceivable. Against this background, the long-term development of end-user fuel and electricity prices is not only dependent on (global) price and cost developments and is therefore uncertain. Projection results must in principle be considered and classified against this background.

Table B21: Gas well as electricity prices by consumer group and hydrogen prices 2021 to 2040, in cent (2022)/kWh

	IN	IN	IN	2019	2025	2026	2027	2028	2029	2030	2035	2040	2045	2050
Gas														
Gas Border crossing price	2.98	8.38	5.77	5.63	4.80	3,71	3.15	2.86	2,57	2,28	2,19	2.09	1,99	1.90
Budget D1 (& 20 GJ)	10.15	13,04	14,66	15.84	15,59	14,78	14,48	14,44	14,40	14,34	15.24	15,93	16.42	16.76
Budget D2 (20-200 GJ)	7.85	9.88	12,14	12.74	12,14	10,97	10.49	10.36	10.21	10,06	10.95	11.61	12,08	12.40
Budget D3 (> 200 GJ)	6.93	8.91	11.45	12,01	11.35	10,13	9,63	9.48	9.33	9.16	10,04	10.70	11.17	11,48
Industry I1 (& 1000 GJ)	7.09	8.76	11.40	12,04	11.36	10,11	9.59	9.44	9.27	9,10	9.99	10.65	11,12	11.43
Industry I2 (1.000-10.000 GJ)	5.98	7.81	10,28	11,08	10,42	9,23	8.74	8.60	8.45	8.30	9,19	9.86	10,34	10,66
Industry I3 (10.000-100.000 GJ)	5.04	7.50	8.59	9.41	8.92	8,00	7.65	7.59	7.52	7.44	8.37	9.07	9,58	9,92
Industry I4 (100.000-1 000 000 GJ)	5.06	8.59	8.24	8.93	8.36	7.34	6.95	6.86	6.77	6.66	7.57	8.25	8.74	9.08
Industry I5 (1.000.000 – 4 000 000 GJ)	5.70	11,01	7,21	8.17	7.69	6.83	6.51	6.46	6.40	6,33	7,24	7.93	8.43	8.77
Industriei I6 (> 4 000 GJ)	6.43	13,54	6,52	8.83	8,12	6.92	6.43	6.29	6.15	5.99	6,88	7.54	8,02	8.33
Electricity														
Household Volume DA (& 1000 kWh)	49,56	49.80	51.93	52,92	50.50	49.30	48,69	48,68	48,98	49.47	50,24	48.71	48,16	47.49
Household Volume DB (1.000-2.500 kWh)	37.66	36,90	40.59	40,91	38.10	36,20	35,01	34,55	34,48	34,63	34,45	32,79	32,72	32,46
Household Volume DC (2.500-5.000 kWh)	34,03	33.19	36,75	36,94	34,16	32,18	30,92	30,39	30,25	30,33	29,98	28,35	28,39	28,24
Household volume DD (5.000-15.000 kWh)	31,05	30,19	34,19	34,24	31,45	29,40	28,06	27.45	27,23	27.24	26,68	25,04	25,13	25,01
Household Volume DE (> 15.000 kWh)	26,78	28,21	30,88	30.85	28,28	26,35	25.07	24,47	24,23	24,20	23,56	22.00	22.07	21,96
Industry band IA (&20 MWh)	31,72	31,78	32,46	32.71	30,23	28,51	27,42	27,00	26,92	27.05	26,93	25,59	25,72	25,66
Industry band IB (20-500 MWh)	25,93	27,12	24,43	24,62	22.71	21,37	20,53	20,19	20.13	20.22	20.12	19.10	19,22	19,20
Industry band IC (500-2.000 MWh)	23,14	24,92	21,56	21,64	19,79	18,44	17.57	17,19	17.08	17,12	16.91	15.92	16.11	16.14
Industry tape ID (2.000-20.000 MWh)	19,80	23,07	20,19	20.12	18,05	16.43	15.36	14,85	14,64	14,60	14,15	13,08	13,40	13,54
Industry band IE (20.000-70.000 MWh)	16,48	22.06	18,96	18.81	16.69	14,99	13,84	13,28	13.02	12.95	12,38	11.28	11.65	11.83
Industry tape IF (70.000-150.000 MWh)	15.72	20.94	16.72	16.49	14,46	12,78	11,63	11,04	10.75	10,63	9.94	8.87	9,24	9.43

Industry band IG (> 150.000 MWh)	13,81	22,63	14,76	14,56	12,72	11,19	10,16	9,63	9,38	9,28	8,71	7,77	8,15	8,36
H2 Border crossing price	22.15	21.20	20.25	19.30	18,35	17.40	16.45	15.50	14,55	13,60	11,60	9.60	9,10	8.60

Source: Modelling projection data 2024, Co-action Scenario (MMS)

4.6. Research, innovation and competitiveness

4.6.1. The current situation of the low-carbon technology sector and, where possible, its position on the global market (this analysis is to be carried out at Union or global level)

Low-carbon technologies are an integral part of the green technology sector. Current political, social, technological and economic developments are driving the sector forward in an unprecedented way: This includes, in addition to the European Union's Green Deal, the growing demand for sustainable economic concepts and efforts to rebuild economies in a climate-friendly way to overcome the COVID-19 pandemic.

Previous forecasts of global and national market growth have been clearly confirmed and continue to provide a positive outlook (BMU, 2021). In 2020, the market volume of German environmental technology and

Resource efficiency to 392 billion euro. By 2030, the total volume of domestic lead markets will more than double to EUR 856 billion. This corresponds to an annual average growth rate of 8.1 per cent. Energy efficiency remains the largest lead market (EUR 117 billion), followed by the lead market on sustainable mobility (EUR 91 billion).

The energy transition drives the lead market towards environmentally friendly generation, storage and distribution of energy. In addition to renewable energy photovoltaics and wind, stationary storage technologies in the form of batteries and hydrogen will boost the market even more in the future. The expected annual growth by 2030 is 8.5 % higher than the industry average.

In addition, the increasing interconnection of generation, distribution and consumption of electricity and heat requires major investments. Within sustainable mobility in line with the UN 2030 Agenda, demand shifts from efficiency technologies to e-mobility. Alternative propulsion technologies have by far the largest expansion speed. The market segment will develop between 2020 and 2030 with an average annual growth of 13.3 per cent, resulting in a global market volume of EUR 623 billion by 2030 (2016: EUR 34 billion).

German suppliers are successful in defending their position in the global market. Products, processes and services of environmental technology and resource efficiency 'Made in Germany' have a strong reputation worldwide and justify the strong export performance of the German industry. While Germany's share of global economic output is around 3 %, environmental technology and resource efficiency companies account for around 14 % of the world market in their sector. Europe remains the most important market for German suppliers; Countries such as Brazil, Mexico, Canada, Japan and South Korea are becoming increasingly important exporters.

4.6.11. Current level of public and possibly private spending on low-carbon research and innovation, current number of patents and current number of researchers

Public spending on energy research has more than doubled over the last decade. In 2022, the Federal Government invested EUR 1.49 billion under the energy research programme. The funds are divided into direct project funding and institutional support for the Helmholtz community. In addition, the Länder reported their own expenditure on energy research totalling around EUR 387 million in 2020 (BMWK 2023).

R & D expenditure in the corporate sector is an important factor in innovation, both in low-carbon technologies and in a competitive economy as a whole. According to estimates by the Association of Finders of Science Statistics, the overall R & D activities of enterprises have recently rebounded significantly following the COVID-19 pandemic (Stifterverband Wissenschaftsstatistik 2024). There are currently no estimates of current expenditure on innovative low-carbon technologies. However, business surveys show that climate action and climate neutrality, among other things, are becoming more important and a driver of research and development activities: More than 41 % of R & D performing companies surveyed wanted to have carried out or commissioned R & D with a concrete contribution to climate neutrality in 2021 (Stifterverband Wissenschaftsstatistik 2023).

Analyses of patent applications published by the German Patent and Trade Mark Office (DPMA) and the European Patent Office (EPO) with effect for Germany show that German companies have a leading position in climate-friendly technologies in their home market. Innovation in electromobility and alternative energy sources has increased significantly in recent years, while the development of alternative energy production has stagnated for years (DPMA, 2021, 2022). Detailed quantitative assessments cannot currently be provided. Recent figures for 2023 show that innovation in renewable energy has increased significantly. For solar, wind and other renewable energy technologies, the number of patent applications increased by 18.6 % compared to the previous year. The development of high-performance storage, such as batteries, is crucial to maximise the use of renewable energy. As a result, the innovation dynamics in battery technology are higher than in the previous year, with almost one third more published patent applications, and almost three times as many as 10 years ago (DPMA 2024).

4.6.11.1. Breakdown of current price elements representing the three main price components (energy, grids, taxes and levies) industrial electricity prices

Electricity prices for industrial companies vary greatly. Recent surveys by the Federal Network Agency and the Federal Cartel Office examine electricity prices for industrial companies (annual purchase volume 24 GWh) which are not covered by the statutory derogations, as at the cut-off date of 1 April 2023 (Table B22). These electricity prices are essentially in the range of 13.39 to 36.14 cents/kWh (excluding VAT). The average price is 23.26 cents/kWh. Table B22 describes the different price components. At 16.70 cents/kWh, the cost of purchasing and distributing energy represents on average more than two thirds of the total price.

Table 22: Electricity price components for industrial customers

Electricity price level for industrial customers (without benefits) as of 1 April 2023	CT/kWh (arithmetic mean values)
Net network charge	3.30
Measurement, metaway operation	0.05
Concession fee	0,14
Levies*	1,01
Electricity tax	2.05
Price component influenced by the supplier (residual amount)	16.70
Total price (excluding VAT)	23,26

Industrial customers with assumed consumption of 24 GWh per year without discounts as reported by electricity suppliers

* Surcharges under KWKG (0.378 ct/kWh), surcharge under § 19 StromNEV (0.06 ct/kWh), offshore grid levy (0.591 ct/kWh).

Source: BNetzA/BKartA (2023)

If, on the other hand, electricity consumers meet the requirements of the rules laid down in the relevant regulations and laws, the various levies and charges will be reduced (Table 23). If all reduction options were met, the price component that could not be influenced by the supplier could fall from just under 10 ct/kWh to less than 1 ct/kWh.

Table B23: Possible benefits for industrial customers

Price cut-off question is value 01. April 2023	Possible reduction	Remaining amount
Current 2.05 your	—2,05	0,00
Net of 2.94 t additional 1.01 surcharge n	—2,64	0,30
	—0.89	0,12
Concert 0,14 sionsab release	—0,14	0,00
Total 6,14	—5.72	0.43

Industrial customers with an imputed decrease of 24 GWh per year Source: BNetzA/BKartA (2023)

On a case-by-case basis, electricity prices vary widely from one undertaking to another. For example, individual purchase volumes and profiles play a role in determining prices. There are also regional differences, such as network charges. Various relief measures, including the EEG-surcharge

and the electricity tax, result in reduced electricity costs under certain conditions, in particular for companies whose production is particularly energy-intensive and which face strong international competition. These relief arrangements contribute to the preservation of the

Industrial site in Germany. For the Federal Government, it is clear that the international competitiveness of German industry must be ensured. The objective remains to avoid the relocation of companies to countries with lower environmental standards or lower levies on energy (carbon leakage).

4.6.iv. Description of energy subsidies, including for fossil fuels

In particular, Germany currently has the following subsidies for energy (Table B24), which also subsidise, directly or indirectly, fossil fuels.

Table B24: Overview of subsidies related to energy sources according to the Federal Government subsidy report

No.	Title of the subsidy	Objective of the action and climate impact	Duration/ Expiration
1	Subsidies for the sale of German hard coal for electricity generation, sales to the steel industry and compensation for charges resulting from: Capacity adjustment	<p>The amount of the grant, or Grants, or Taxreduction in 2 023 in EUR</p> <p>(Data Circular 29. Subsidyreport from the Federal-Government)</p>	Ensure the social and regionalend of the German coal industry by the end of 2018. Expired on 31/12/2018
2	Grant of adjustment allowance (APG) to coal workers	45.500.000	Ensure the social and regionalend of the German coal industry by the end of 2018. Limited to 2027

3	Electricity price-compensation	2.993.000.000	Subsidies to electro-intensive companies to compensate for ETS-related increases in electricity prices.	Limited to 31.12.2030
4	Tax relief for agricultural and forestry enterprises (agricultural diesel)	440.000.000	Farms shall receive an advantage for taxed diesel fuel in so far as it has been used for land management or soil-bound livestock farming. The purpose of the subsidy is to maintain an independent supply and to ensure the competitiveness of German agriculture and forestry.	Gradually expiring on 1.1.2026
5	Tax relief for Energy products used for the propulsion of gas turbines and internal combustion engines in eligible installations under § 3 EnergieStG (electricity generation, cogeneration, gas transport and gas storage)	The tax burden is not de facto reduced by the advantage.	The measure is based on the technical distinction between heating and motor fuels laid down in EU law and therefore does not constitute support. Motor fuels are thus initially reduced to the Heizstoff rate for certain uses (mainly electricity generation in CHP plants). Thus, as a result, tax advantages on inputs in the production of electricity can lead to double taxation (on the output side, there is a risk of double taxation. Electricity tax).	perpetual
6	Favourable tax treatment of Energy products which are: Related to the production of energy products (manufacturer privilege)	270.000.000	In the case of self-produced energy products, the tax relief is mandatory under EU Directive 2003/96/EC. An optional energy tax reduction is foreseen for external energy products, implementing a relief to the EU minimum tax rate.	perpetual
7	Energy taxation increases for certain processes and processes	450.000.000	The subsidy exempts particularly energy-intensive processes and processes from energy tax.	perpetual
8	Energy tax benefits for electricity generation	1.750.000.000	The measure aims to avoid double taxation of electricity generation.	perpetual
9	Full energy tax relief for combined heat and power	200.000.000	The measure supports the production of electricity and heat in CHP plants.	Expired on 31.12.2023
10	Partial energy tax relief for combined heat and power	85.000.000	The measure supports the production of electricity and heat in CHP plants.	perpetual
11	Energy tax benefits for companies active in the manufacturing sector and companies in the following sectors:	170.000.000	The purpose of the support is to ensure the international competitiveness of the producer's enterprises. Trade, agriculture and forestry	perpetual

	Agriculture and Forestry			
12	Energy tax benefits for manufacturing companies in special cases (peak compensation)	(175.000.000)	The scheme granted relief to companies in the manufacturing sector in order not to place a burden on them beyond a sustainable contribution in terms of their international competitiveness. The scheme was designed to protect against carbon leakage. The peak energy tax compensation applied until the end of 2023.	Expired on 31.12.2023
13	Electricity taxation for undertakings active in the manufacturing and agriculture and forestry sectors	950.000.000 2019 TO 2024 3.650.000.000 2025 4.500.000.000	The purpose of the support is to ensure the international competitiveness of manufacturing, agriculture and forestry enterprises. For the years 2024 and 2025, the relief under the Federal Government's electricity price package has been increased.	perpetual
14	Electricity taxation for certain processes and processes	750.000.000	The subsidy exempts particularly electro-intensive processes and processes from electricity tax. The support will ensure the competitiveness of the German industry and protect against carbon leakage.	perpetual
15	Electricity tax for undertakings in the manufacturing sector in special cases (peak compensation)	(1.375.000.000)	The scheme granted relief to companies in the manufacturing sector in order not to place a burden on them beyond a sustainable contribution in terms of their international competitiveness. The scheme was designed to protect against carbon leakage. Peak electricity tax compensation applied until the end of 2023.	Expired on 31.12.2023
16	Tax relief for natural gas used as fuel	36.000.000	Gas fuels can substitute liquid fossil fuels and contribute to the diversification of energy supply. The support served to conserve resources and combat climate change for the establishment of natural gas in the fuel market.	Limited to 31.12.2026
17	Energy taxes on machinery and vehicles used exclusively for the handling of goods in seaports	25.000.000	The subsidy encourages the shift from road to maritime and rail transport, which can have a positive impact on the environment.	perpetual
18	Tax relief for Energy products used in domestic air transport	504.000.000	The purpose of the subsidy is to safeguard Germany's economic location.	perpetual
19	Tax relief for Energy products used in the Inland waterway transport is used	115.000.000	The aim is to align the conditions of competition between shipping navigating on other waterways with the tax exemption applicable to the Rhine River Basin on the basis of international treaties.	perpetual

20	Tax relief for local public transport	65.000.000	Strengthening local public transport up to 50 km will contribute to climate-friendly mobility.	perpetual
21	Electricity tax for running in the railways and for traffic with Overhead contact line omnibussen	115.000.000	The subsidy strengthens the environmentally friendly modes of transport (railways and trolleybuses) compared to private transport.	perpetual
22	Reduced electricity tax for Shore-side electricity supply of Watercraft	2.000.000	Favouring shore-side electricity is intended to reduce air pollution in German seaports.	perpetual
23	Tax exemption for electricity from renewable sources	64.000.000	To provide an incentive electricity produced in large renewable energy installations at least to: Use part already at the place of production.	perpetual
24	Exemption for electricity produced from so-called small installations with a rated output of up to 2 megawatts	622.000.000	The exemption promotes the production of electricity and the use of renewable energy sources and high-efficiency installations for the combined production of power and heat.	perpetual
25	Tax relief for the public sector Public transport	1.000.000	The purpose of the subsidy is to safeguard and strengthen the competitiveness of local electric passenger transport.	perpetual

More detailed information can be found in the latest 29. Subsidy report from the Federal Government.

5. Impact assessment of planned policies and measures

5.1. Impact of planned policies and measures described in Section 3 on the energysystem and GHG emissions and removals compared to projections with current policies and measures (as described in Section 4)

5.1.1. Projections of the evolution of the energy system and of greenhouse gas emissions and removals, but also, where relevant, of emissions of air pollutants in accordance with Directive (EU) 2016/2284, with the planned policies and measures at least until 10 years after the period covered by the plan (including the last year of the period of validity of the plan), taking into account relevant Union policies and measures

With appropriate policies and measures, greenhouse gas emissions should be reduced by at least 65 % by 2030. In addition, as Germany's contributions to the EU energy targets, Germany's primary energy consumption is expected to decrease by 39.3 % by 2030 compared to 2008 and final energy consumption by at least 26.5 % by 2030 compared to 2008. The share of renewable energy in gross final energy consumption in Germany is expected to be 42.5 per cent in 2030 (Chapter 2).

The following analysis of the planned policies and measures in the context of an impact assessment is based on a scenario showing a possible future evolution of the energy system in Germany. The Scenario set out below is based on the reference scenario (Chapter 4). In addition, the additional measures planned in autumn 2023 (see Chapter 3) are taken into account. The scenario is therefore in line with the co-continuation scenario in the reporting under Article 18 of Regulation (EU)

2018/1999 (Governance Regulation). Further measures, which were additionally planned after autumn 2023 or changes to measures adopted after that date other than previously planned, could be used for the

Projections are no longer taken into account. Furthermore, projections assume that the exogenous factors presented, the evolution of the energy system and GHG emissions remain unchanged (see chapter 4.1).

GHG emission

The results of the projections for the evolution of greenhouse gas emissions with further measures are described in Table B25. Total emissions excluding international transport and LULUCF will be reduced to around 454 MtCO₂eq by 2030. This still represents a reduction of almost 64 % compared to 1990.

Table B25: Greenhouse gas emissions by sector for the years 2024 to 2050 in MtCO₂eq

	2019 TO 2024	2025	2026	2027	2028	2029	2030	2035	2040	2045	2050
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Energy-related emissions	569	549	502	457	422	395	362	221	135	95	85
Energy	208	198	164	133	115	108	95	54	35	35	39
Industry	101	99	96	93	89	84	80	55	41	32	30

Traffic	148	144	141	135	128	121	111	67	32	15	6
Other*	109	103	98	93	87	80	73	43	25	12	9
Fugitive emissions	3	3	3	3	3	3	3	2	1	1	1
Non-energy emissions	108	108	105	101	99	94	90	70	64	65	67
Industrial processes	50	50	48	46	44	40	38	24	17	17	17
Agriculture	52	52	52	51	51	50	50	48	47	47	47
LULUCF	0	2	0	-1	0	-1	-2	-5	-3	-2	0

	2019 TO 2024	2025	2026	2027	2028	2029	2030	2035	2040	2045	2050
Waste	5	5	5	5	4	4	4	4	3	3	3
Total excluding LULUCF	677	655	607	559	521	491	454	296	202	163	152
Total including LULUCF	677	657	607	558	521	490	452	291	199	161	153
<u>For information:</u>											
International air and Seaborne	35	37	38	40	42	42	42	40	40	40	36

* Industry, commerce and services; Households; Agriculture-energy; Military

Source: Modelling Projection Data 2024, Co-Further Action Scenario (MWMS)

The so-called LULUCF sector is currently a source of greenhouse gas and is also failing to meet its 2030_{sink} targets by 23.7 MtCO₂eq. (Target: –25 Mt CO₂eq.). The projection highlights the urgent need to strengthen the sector's role as a natural carbon sink, which is important for climate action.

The projections of annual greenhouse gas emissions can in turn be based on emissions in the ETS sectors and sectors subject to the EU Climate Change Regulation (Table B26). For this purpose, the conventions are as described in the corresponding tables in Chapter 4.

Table B26: Greenhouse gas emissions – under ETS and EU Climate Change Regulation (ESR) for the years 2024 to 2050, in MtCO₂eq

	2019 TO 2024	2025	2026	2027	2028	2029	2030	2035	2040	2045	2050
ETS emissions (stationary)	306	294	255	219	196	183	165	97	63	55	56
ESR emissions	370	360	351	338	324	307	287	199	139	107	96

Source: Modelling Projection Data 2024, Co-Further Action Scenario (MWMS)

Based on the projections with the additional measures, the cumulative emissions over the total ESR-relevant period from 2021 to 2030 are 111 Mt CO₂eq more than the EU climate change mitigation (ESR) target for Germany. The Federal Government is currently examining the feasibility of further measures (see Chapter 5.1.ii).

Renewable energy

The development of renewable energies in the results of the projections with further measures is described below: As in chapter 4.2.1, renewable hydrogen, so-called green hydrogen, can have a relevant impact on the shares of renewable energy in all three sectors. The modelling of the 2024 projection data used here in the report covers hydrogen imports as a whole, without specifying to

what extent these imports come from renewable energy sources or from other sources. However, in order to be able to identify the sectoral and technological renewable shares at this point, calculations were carried out in two variants, covering the entire theoretical range of results. The actual future share will be within this area.

Table B27a describes the evolution when imports of hydrogen and hydrogen derivatives are entirely from renewable energy (100 % green hydrogen) over the entire period.

Under these assumptions, the share of renewables in gross final energy consumption will increase by 18 percentagepoints from 2023 to 38.2 % in 2030 (EU statistics; according to national statistics, the share is 38.1 % in 2030.) In the following years, the increase continues steadily. The 2030 target of 41 per cent will be achieved in this projection in 2031. The Federal Government will monitor the further development of the share of renewable energy in gross final energy consumption and will examine ways to ensure that the 41 % renewable energy target set for 2030 can be met earlier. The share is already 73 % in 2040.

Table B27a: Renewable energy in – shares of total sectoral consumption for the years 2024 to 2050, as a percentage – assuming only green hydrogen imports

	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2044	2035	2040	2045	2050
Gross final energy consumption (RED II)	23.6	25.4	27.4	29.6	31.9	34.9	38.2	41.7	45.2	49.4	53,5	57.4	73.1	82.1	88.8
Gross final energy consumption (national statistics)	23.6	25.5	27.5	29.6	31.9	34.9	38.1	41.5	45.0	49.1	53.1	56.9	72.0	80.2	86.4
Electricity (Red II and national statistics)	54.3	57.3	61.1	63.7	65.5	68.3	72.3	76.4	78.9	82.5	85.2	87.1	94.8	95.0	94.2
Wind on land	21.3	21,9	22,9	23.6	24,1	24.8	25.4	26.2	27,0	28.4	29.6	30.6	33.3	32.2	32.1
Offshore wind	5,6	6.3	7.1	7,6	7,9	9,1	11,7	13.9	14.7	15.7	16.3	16.6	16.7	19.3	19.4
Photovoltaic	15.2	17.8	20,4	22.7	24,5	26.3	27.8	29.2	30.4	31.9	33.2	34.1	39.6	38.2	37.1
Hydropower	3.7	3.6	3.5	3.3	3.2	3.0	2.8	2.7	2,5	2,5	2.4	2.3	2.1	1.9	1.9
Biomass (including biogenic part of the Waste)	8.3	7.7	7.1	6.5	5.7	5.0	4.2	3.8	3.5	3.4	3.2	3.0	2.8	3.0	3.4
Geothermal	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,0	0,0	0,0
Imported greener Hydrogen	0,0	0,0	0,0	0,0	0,0	0,0	0.3	0.6	0.7	0.6	0.5	0.5	0.2	0.2	0.2
Transport (RED II)	10.3	12.8	15,9	20,3	25,9	31.6	37.7	44.2	51.1	58.2	64.5	71.2	92.5	101.3	108.5
Transport (national statistics)	6.6	7,6	8,6	10.2	12,1	14,0	16.6	19.5	22.6	26.3	30.6	35.3	56.7	68.2	82.7
Biodiesel (including HVO and vegetable oil)	3.5	3.6	3.6	3.7	3.8	3.4	3.5	3.2	3.0	2.7	2.4	2.2	1.0	0,9	0.8
Biogenic petrol	1.2	1,3	1.4	1.5	1.6	1.7	1.8	1.8	1.7	1.7	1.6	1.4	0.8	1.1	1,3
Biogases	0,1	0,1	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
Renewable electricity	1.7	2.3	3.0	3.9	5.1	6,8	9,0	11.5	14,1	17.1	20.2	23.3	38.8	48.8	54.1
Green hydrogen/e-fuels	0,0	0,1	0.2	0.6	1.0	1,3	1.4	1.4	1.4	2.4	3.9	5.7	12,6	12,7	18.4
Heating and cooling (Eurostat and national statistics)	20.2	21.7	23.2	24.7	26.4	28,9	30.5	32.4	35.3	38.8	42.4	46.2	58,0	68.3	71.3
Biomass and renewable Wastes	15,0	15.7	16.4	17.1	17.9	19.2	19.7	20.2	21,0	21.7	22.5	23.9	27.6	31.4	32.8
Other renewable Energies	5.2	6,0	6,8	7.4	8.2	9,1	10,1	11,1	12,3	13.7	15,1	16.4	21.7	25.3	26.5
Hydrogen	0,0	0,0	0,0	0,1	0.3	0.5	0.8	1.1	2.1	3.4	4.8	5,9	8,7	11.6	11,9

Other renewable energies include geothermal energy, environmental heat, solar thermal, renewable district heating.

Important: Deviations of totals due to rounding differences. Multiple counting in transport under the

Renewable Energy Directive can lead to calculated renewable shares above 100 %.

Source: Modelling 2024 Projection Report, Co-Further Action Scenario (MWMS)

In the electricity sector, the share of renewables in gross electricity consumption in 2030 is 72.3 %. This is slightly lower than in the reference scenario (chapter 4.2.2), as gross electricity consumption is slightly higher than in the baseline scenario, with approximately constant electricity production from renewable sources. As in the reference scenario, the target value of 80 % will be reached by 2032 at the latest.

In the transport sector, the share of renewable energy is rising to 37.7 % by 2030 according to EU statistics due to the multiple counting of individual technologies enshrined therein (16.8 % according to national statistics). Compared to the reference scenario (38.0 percent), the share remains almost constant.

The scope of heating and cooling is, in turn, based on an identity of statistical values, as a simplistic approach. By 2030, the share of newcash energy will increase to a level of 30.5 %. This corresponds to the share of the reference scenario (30.2 %) and remains above the target of 23.5 % for 2030.

Table B27b describes the development of the opposite assumption that imports of hydrogen and hydrogen derivatives come entirely from sources other than renewables (0 % green hydrogen). In particular, the share of renewables in gross final energy consumption and gross electricity consumption in 2030 is slightly lower than when assuming hydrogen imports from renewable sources only.

**Table B27b: Renewable energy shares in sectoral
Total consumption for the years 2023 to 2050, as a percentage – assuming
Hydrogen imports exclusively from non-renewable sources**

	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2044	2035	2040	2045	2050
Gross final energy consumption (RED II)	23.6	25.4	27.4	29.4	31.6	34.6	37.9	41.5	45.1	48.6	52.0	55.1	67.9	76.3	80,5
Gross final energy consumption (national statistics)	23.6	25.5	27.5	29.5	31.6	34.6	37.8	41.4	44.9	48.4	51.6	54.6	67.0	74.7	78.6
Electricity (Red II and national statistics)	54.3	57.3	61.1	63.7	65.5	68.3	72.0	75.9	78.3	81,9	84,7	86.6	94.6	94.8	94.0
Wind on land	21.3	21,9	22,9	23.6	24,1	24.8	25.4	26.2	27,0	28.4	29.6	30.6	33.3	32.2	32.1
Offshore wind	5,6	6.3	7.1	7,6	7,9	9,1	11,7	13.9	14.7	15.7	16.3	16.6	16.7	19.3	19.4
Photovoltaic	15.2	17.8	20,4	22.7	24,5	26.3	27.8	29.2	30.4	31.9	33.2	34.1	39.6	38.2	37.1
Hydropower	3.7	3.6	3.5	3.3	3.2	3.0	2.8	2.7	2,5	2,5	2.4	2.3	2.1	1.9	1.9
Biomass (including biogenic part of the Waste)	8.3	7.7	7.1	6.5	5.7	5.0	4.2	3.8	3.5	3.4	3.2	3.0	2.8	3.0	3.4
Geothermal	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,0	0,0	0,0
Imported greener Hydrogen	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
Transport (RED II)	10.3	12.8	15,9	19.8	25,0	30.5	36.6	43.2	50.1	56.5	62.3	68.2	87.4	96.3	101,0
Transport (national statistics)	6.6	7,6	8,6	9.8	11.4	13,0	15.5	18.4	21.4	24.6	28,0	31.5	47.9	58,0	66.1
Biodiesel (including HVO and vegetable oil)	3.5	3.6	3.6	3.7	3.8	3.4	3.5	3.2	3.0	2.7	2.4	2.2	1.0	0,9	0.8
Biogenic petrol	1.2	1,3	1.4	1.5	1.6	1.7	1.8	1.8	1.7	1.7	1.6	1.4	0.8	1.1	1,3
Biogases	0,1	0,1	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
Renewable electricity	1.7	2.3	3.0	3.9	5.1	6,8	9,0	11.4	14,0	17.0	20,0	23,1	38.7	48.7	54,0
Green hydrogen/e-fuels	0,0	0,1	0.2	0.2	0.2	0.3	0.3	0.3	0.4	0.8	1.4	2.1	3.9	2.6	1.9
Heating and cooling (Eurostat and national statistics)	20.2	21.7	23.2	24.7	26.5	29.1	31.1	33,5	36.6	39.3	41,9	44,7	55.0	65.8	71,0
Biomass and renewable Wastes	15,0	15.7	16.4	17.1	17.9	19.2	19.7	20.2	21,0	21.7	22.5	23.9	27.6	31.4	32.8
Other renewable Energies	5.2	6,0	6,8	7.4	8.2	9,1	10,1	11.2	12.4	13.7	15,1	16.3	21.6	25.2	26.5
Green hydrogen	0,0	0,0	0,0	0.2	0.4	0.7	1.4	2.1	3.2	3.8	4.3	4.5	5.8	9.2	11.6

Other renewable energies include geothermal energy, environmental heat, solar thermal, renewable district heating.

Important: Deviations of totals due to rounding differences. Multiple counting in transport under the Renewable Energy Directive can lead to calculated renewable shares above 100 %.

Source: Modelling 2024 Projection Report, Co-Further Action Scenario (MWMS)

When looking at both tables as a whole, the share of renewable energy in gross final energy consumption according to EU statistics in 2030 ranges from 37.9 % to 38.2 %. (From 37.7 % to 38.0 % according to national statistics) the share of renewable energy in the electricity sector is in a narrow range in 2030, ranging from 72.0 % to 72.3 %. The share of renewable energy in transport varies from 36.6 % to 37.7 % according to EU statistics in 2030 (16.8 % according to national statistics). The share of renewables in heating and cooling in 2030 ranges from 30.5 % to 31.1 %.

Primary and final energy consumption

The evolution of primary and final energy consumption is shown in Table B28. Primary energy consumption is reduced to 10.152 PJ by 2030. This is slightly higher than in the reference scenario (10.148 PJ; Table B15). In this scenario, primary energy consumption also decreases by 29.4 % by 2030 compared to 2008. The decrease in consumption by 2040 is 38.6 %.

Final energy consumption in 2030 is 7.815 PJ, slightly lower than in the reference scenario (7.883 PJ). It decreases by 16.2 % between 2008 and 2030, which is slightly higher than in the reference scenario (15.5 %). The decrease up to 2040 accounts for 29 %. The decline in final energy consumption is spread across sectors in different ways: Consumption in industry, commerce and services fell significantly by 2030 compared to 2008 (-38 per cent). There are also decreases in consumption for households (-21 %) and for industry and transport (-7 % each).

Table B28: Primary energy consumption (PEV), final energy consumption (FEC) – total and by sector for the years 2024 to 2050, in PJ

		2025	2026	2027	2028	2029	2030		2040	2045	2050
PEV	11.001	10.915	10.727	10.561	10.482	10.341	10.152	9.309	8.826	8.717	8.768
EEV	8.312	8.288	8.248	8.191	8.108	7.969	7.815	7.107	6.627	6.336 i	6.238
Industry ¹	2.285	2.329	2.364	2.400	2.422	2.401	2.384	2.326	2.313	2.307	2.375
Traffic	2.569	2.575	2.574	2.560	2.538	2.487	2.427	2.129	1.913	1.823	1.785
Households	2.312	2.272	2.230	2.189	2.143	2.111	2.071	1.867	1.695	1.567	1.477
GHD2	1.147	1.112	1.079	1.042	1.005	970	933	785	706	639 1	601

1 other mining and manufacturing;

2 Industry, commerce, services

Source: Modelling 2024 Projection Report, Co-Further Actions

Scenario (MWMS)

The figures shown in Table B28 are based on calculation methods by the German Working Group on Energy Balance. However, some of these differ from Eurostat's methodology for calculating energy efficiency targets (see chapter 2.2). Based on the calculation of Eurostat methodologies and on the basis of the MWMS, primary energy consumption is reduced to 9.004 PJ and final energy consumption to 7.448 PJ by 2030.

Table B29 shows the evolution of primary energy consumption according to the energy source structure. It changes only slightly over time compared to the reference scenario (Table B18). For example, similar levels of consumption of hard coal and lignite are gradually decreasing.

Table B29: Primary energy consumption – by energy source by 2050, in PJ

	2019 TO 2024	2025	2026	2027	2028	2029	2030	2035	2040	2045	2050
Coal	705	625	547	430	365	313	219	85	41	18	15
Lignite	887	820	499	265	113	76	36	24	20	17	15

	2019 TO 2024	2025	2026	2027	2028	2029	2030	2035	2040	2045	2050
Mineral oils	4.092	4.063	4.055	4.002	3.943	3.786	3.618	2.713	2.029	1.727	1.443
Gases	2.807	2.769	2.810	2.810	2.800	2.707	2.593	1.577	1058	816	844
Nuclear energy ^a	0	0	0	0	0	0	0	0	0	0	0
Renewable energy	2.241	2.381	2.530	2.676	2.830	3.033	3.255	4.328	5.076	5.475	5.689
Other energy sources	246	256	264	286	311	331	348	611	772	814	906
External trade —balance electric energy*	22	1	23	93	120	95	84	—28	—171	—151	—143
Overall	11.001	10.915	10.727	10.561	10.482	10.341	10.152	9.309	8.826	8.717	8.768

* including small shares of district heating

Source: Modelling 2024 Projection Report, Co-Further Actions Scenario (MWMS)

Air pollutants

In accordance with Directive (EU) 2016/2284 (NEC Directive), a projection of emissions of certain air pollutants is to be submitted every two years; in addition, a National Air Pollution Control Programme (NLRP) must be submitted at least every four years, including measures to achieve the emission reduction obligations of the NEC Directive. The second NLRP was adopted by the Federal Cabinet on 15 May 2024 and sent to the European Commission.

Maximise consistency of reporting in the NECP and the NLRP; this should also avoid mismanagement resulting from the fact that climate action does not always lead to a reduction in air pollutant emissions (e.g. Particulate matter from the combustion of wood or NO_x during the combustion of hydrogen). However, in order to ensure consistent reporting, there are significant challenges arising from the different deadlines.

5.1.ii Assessment of strategic interactions (between current and planned policies and measures within a policy area and between current and planned policies and measures of different policy areas) at least until the last year of the period of validity of the plan, in particular with the aim of gaining a comprehensive understanding of the impact of energy efficiency/saving measures on the required size of the energy system, thereby reducing the risk of non-amortisable investments in energy supply

Further improvement of energy efficiency in the building stock is a key building block of the Federal Government's climate policy. Related policies and measures are also part of the most recent 2023 climate action programme.

Following the suspension of the planned increase in the price path in 2023, CO₂ pricing for heating and transport is planned to be increased again as of 2024 in order to improve the economic viability of climate-friendly techniques against more climate-damaging alternatives in a targeted manner. From 2027 onwards, the transfer of this national carbon pricing to the new EU ETS 2 is planned.

In accordance with Section 4 of the KTF Act, revenues from European and national CO₂ pricing – insofar as they are not needed to finance the German Emissions Trading Agency – are transferred to the Climate and Transformation Fund (see 3.1.1.iii). Support programmes remain an integral part of the policy mix, not least in order to avoid social hardship. At regular intervals, the funding requirements are adapted to the transformation pathways needed to achieve the objectives, as was done, for example, in 2023 when the Federal Funding for Efficient Buildings (BEG) was revised. Carbon leakage risks are addressed by the funding guidelines on electricity price compensation and the Regulation on measures to prevent carbon leakage from national fuel emissions trading (BECV), which entered into force in 2021.

National carbon pricing for emissions outside the EU ETS makes sustainable biomass economically more attractive as an energy source in line with the UN 2030 Agenda, moving to energy uses, sometimes competing, such as electricity generation, biofuels or thermal recovery in industry and buildings. The sustainable potential of raw materials for biomass use in Germany is limited, as is the case for imported biomass. It is therefore important to make the use of scarce biomass efficient, sustainable and climate-friendly. The framework conditions for sustainable, climate-effective and resource-efficient biomass production and use in Germany are currently being developed in the National Biomass Strategy (Nabis).

The German energy efficiency policy identifies efficiency potentials across all sectors and thus allows targeted support programmes to be developed or further developed. Due to the multiplicity of interactions between individual policies and measures, the integrated impact of the programme can only be considered in this way and not as a sum of the effects of individual measures. The following points are examined in more detail:

Rebound effects can occur in energy saving measures, for example in buildings or industry. The immediate effect of saving energy by means of a measure is offset by a partial increase in energy consumption. For example, renters of rehabilitated valleys heat their homes at a higher temperature than before renovation, thereby resuming some of the energy savings that can be expected. Therefore, support programmes in the building sector should focus on greenhouse gas emissions per square meter. By calculation, the interactions of energy efficiency measures shall be taken into account when determining savings effects through individual interaction factors. An overview of this can be found in the Excel worksheet attached to the report with the detailed list of measures and description of measures for the implementation of Article 8 EED. A description of how the additionality of the respective measures was assessed can be found in the maps of the measures presented in the methodological aspects.

In the energy sector, the phasing out of coal-fired power generation and the accelerated deployment of renewable energies are two major and landmark policy measures that are closely

linked: The gradual decline in fossil-based electricity production from brown and hard coal will be replaced by additional renewable electricity. Security of supply is always upheld. The necessary changes to the regulation of energy markets and infrastructure planning are part of the energy transition.

A number of cross-cutting policies and systemic contexts are relevant for strategies and measures across different policy areas:

For example, increased electrification in transport and heating and cooling significantly contributes to the substitution of fossil fuels and thus to the effective decarbonisation of these sectors. At the same time, photovoltaic installations are increasing on buildings, mostly injected into the grid or used for mobility or heat applications. This sector coupling strategy is important to achieve greenhouse gas reductions in all sectors and to achieve the overarching climate objectives. Measures such as promoting electromobility or heat pumping lead to increased electricity demand. If the aggregate amount of additional demand is met by fossil-based generation capacity, this creates additional challenges in achieving the targets in the transformation; be it in the renewable energy expansion targets or the decarbonisation of electricity generation. For this reason, the simultaneous reduction of energy demand by increasing energy efficiency is crucial.

Other policies and measures along the five dimensions of the Energy Union

Germany is continuously working on policies and measures to achieve the objectives set out in Chapter 2.

Germany has already reduced the climate protection gap with regard to the reduction of greenhouse gases, which existed in 2021 when the Federal Government took office, by 90 %. Compared to the draft NECP report, Germany has the gap in GHG emission reductions due to the Immediate Climate Action Programme further reduced in 2023. This included measures such as the support programme for decarbonising industry with the supported climate contracts; the Buildings Energy Act, which provides, inter alia, that at least 65 % of new heating systems must be powered by renewable energy (from 1 January 2024). The scheme initially applies in new areas. For existing buildings and new buildings built in building gaps, this requirement only applies once the deadlines for municipal heat planning have expired. The BEG supports the switchover with extensive support centres.

In addition, the Federal Government has adopted a number of measures to further develop and, in particular, accelerate the planning and approval of renewable energies. These are already having an initial impact: The pace of permitting and the roll-out of renewable energy has accelerated significantly. In 2024, 14 GW PVs were expanded. Wind onshore has doubled to 3.6 GW and permits tripled to 8 GW. The reversal of the permit trend is now also leading to a reversal of the tendering trend: in August, for the first time, the tender was oversubscribed for a long time. The ambitious annual target of 10 GW appears achievable. In the first quarter of 2024, Germany had for the first time a share of more than 60 % of renewable energy in the electricity sector. Germany has therefore again increased its renewable energy target to 41 % of gross final energy consumption by 2030, in line with its national contributions under the EU Governance Regulation, compared to the draft

updated NECP. According to the latest projection data, Germany achieves this target in 2031. The Federal Government will take further measures to achieve this target already in 2030. The projections highlighted the importance, in particular, of further speeding up permit-granting procedures for renewables, electricity storages and grids, and of consolidating the elements of the EU Emergency permitting Regulation, which have proved particularly successful as accelerator. Moreover, the Federal Government intends to make greater use of cooperation projects. The North plays a role in this regard.

Sea Cooperation a crucial role. A clear EU framework to support these cooperation projects seems to us to be important and beneficial for the whole of Europe.

In the other sectors too, the Federal Government is in a continuous process and will continuously review and take new measures. The projections of the updated NECP, which started in autumn 2023, could only reflect the measures adopted so far. Other policies and measures in place or planned up to the date of publication of the report are not included. This concerns in particular the increase of the CO₂ price from EUR 35 to EUR 45 or solar package I.

Adopted measures not covered by the projections in the updated NECP

Measure	Dimension*
Increase of CO ₂ price (35 to 45) Euro as of 1 January 2024)	1, 2
Solar Package I	1

*Five dimensions of the Energy Union in the NECP:

- 1: Greenhouse gas emissions and removals (including renewable energy)
- 2: Energy efficiency
- 3: Security of energy supply
- 4: Internal energy market
- 5: Research, innovation and competitiveness

In order to ensure that the objectives set out in Chapter 2 are met and to further reduce the climate gap and further accelerate the expansion of renewable energies, the Federal Government is constantly developing its energy and climate policy. Table 2 shows measures currently under review.

Other measures under consideration

Measure	Description	Dimension*
Adaptation of public procurement law	More attention to product sustainability and energy efficiency	1, 2
Carbon Capture and Storage (CCS), Carbon Removal, negative emissions	Further elaboration of the Carbon Management Strategy, elaboration of the long-term negative emissions strategy	1

Decarbonisation/alternative propulsion in Land and Forestry technology	EUR 1 million research programme on climate-friendly powertrains in agriculture, development of a roadmap to strengthen alternative propulsion technologies (internal combustion engines for non-fossil fuels and electrification) in agriculture and forestry	
e-mobility, bidirectional charging	Remove barriers as soon as possible, drive smart meter roll-out, flexible tariffs, increase incentives	1
Energy efficiency	Possible further energy efficiency governance measures	1 , 2
Draft law transposing Directive (EU) 2023/2413 in the field of onshore wind and solar energy and co-located energy storage facilities, and considering further acceleration of permit-granting procedures for renewables and grids	Identification of further measures to speed up authorisation procedures, including with regard to EU legal requirements and EU legal follow-up	1 , 4
Flexibilisation	variable electricity and dynamic network tariffs and reform of wholesale network tariff exemption, digitalisation, barriers, inclusion of flex in capacity mechanism (growth package decisions) and roadmap flexibility linking points	1, 2, 3, 4
Draft law on speeding up permitting procedures for geothermal plants, heat pumps and heat storage facilities, and	Creating a regulatory framework for the simplified and accelerated deployment of geothermal plants;	1

Changing further regulatory frameworks for the climate-neutral expansion of heat supply	Heat pumps and heat storage.	
Large heat pumps	Coordination of authorisation process for applicants and authorities.	1
Actions on new Materials and construction materials	Extending the lifetime of buildings, improving resource efficiency, strengthening the circular economy	1, 2
Non-residential buildings (MEPS)	Focus on non-residential buildings in the future, with the implementation of minimum energy performance standards under Article 9(1) of the EPBD playing a major role.	1, 2
Offshore wind cooperation	Further advance joint cross-border cooperation projects in the field of offshore wind; Use North Sea Cooperation; Support EU framework/support (e.g. EU top-up channel as a collaborative accelerator)	1.4
Increasing the potential of digitalisation, automation and transparency	Potential of the Emissions reduction through digitalisation, automation and transparency will be addressed more	1, 2, 3, 4
Implementation of the reform of the EU Emissions Trading System, including provisions on the transition from the Fuel Emissions Trading Act (BEHG) to the future EU ETS-2	Including increase in BEHG price to EUR 55-65 by 2026	1, 2
Hydrogen acceleration tz	Accelerate and digitalise planning, permitting and procurement procedures for infrastructure projects that produce, store or import hydrogen	1
Further Actions in the	Planned amendment of the AVB district heating regulation and audit	1

District heating company	adapting the Heat Supply Regulation in order to reduce barriers to, inter alia, the construction and expansion of heat networks;	
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*Five dimensions of the Energy Union in the NECP:

- 1: Greenhouse gas emissions and removals (including renewable energy)
- 2: Energy efficiency
- 3: Security of energy supply
- 4: Internal energy market
- 5: Research, innovation and competitiveness

1.1.iii. Assessment of interactions between existing policies and measures and planned policies and measures, and between those policies and measures and Union climate and energy policy measures

In principle, policies and measures:

The Federal Government always develops and decides on existing and planned European Union measures. This also applies to energy and climate. It is precisely in these areas that positive interactions between individual measures need to be achieved. Resulting synergies and spill-over effects are important as they can support and accelerate the achievement of national and European energy and climate targets.

1.2. Macroeconomic and, to the extent feasible, the health, environmental, employment and education, skills and social impacts, including just transition aspects (in terms of costs and benefits as well as cost-effectiveness) of the planned policies and measures described in section 3 at least until the last year of the period covered by the plan, including comparison to projections with existing policies and measures

Impact on the economy, education, skills and social conditions

Investment is crucial for the macroeconomic impact. The changed policy framework will lead to additional investment in almost all sectors of energy production and use. Assuming that these investments would not have taken place without climate policy adjustments and do not crowd out other investments to the same extent, there is an expansionary effect on gross domestic product (GDP).

According to estimates on behalf of the UBA (2024d, e), which also include sensitivities, including crowding out of other investments, a medium assumptions scenario with additional measures compared to the reference development (Chapter 4) leads to a positive macroeconomic effect. The gross domestic product (GDP) in volume terms is 0.4 % higher in 2030 than in the reference scenario. According to this estimate, this corresponds to a higher

GDP level of 15.5 billion euro (Table B30). This momentum continues to increase until the middle of the next decade and then weakens. The main reasons for this expansionary impact are the overly great investments made with the implementation of the further measures. This overall effect may vary across sectors of the economy and may lead to structural shifts between different sectors of the economy. The additional measures are estimated to create a need for additional workers. An additional 158.000 full-time equivalent employment will be required by 2030.

Table B30 GDP and labour demand: Deviations between the additional measures scenario and the reference scenario

		2025	2030	2035	2040	2045
GDP (GDP)	in EUR 2 022 billion	0.8	15.5	36.3	22.6	18.8
	in percent	0,0	0.4	0,9	0.5	0.4
Labour requirements	in thousand	9,0	158,0	325,0	148,0	88,0
	Full-time equivalents					

Source: UBA (2024 d,e) Impact Assessment Projection Data 2024, with action and action scenarios (MMS; MWMS).

Looking back, employment in the energy sector, for example, has changed sharply: Over the last two decades, there has been a gradual but tangible shift in employment from traditional, mostly conventional, energy sectors to renewables. Such a development is a logical consequence of the intended decarbonisation of the energy system in Germany and will continue. But digitalisation and the transformation of the economy towards net-zero greenhouse gas emissions are also leading to massive shifts in the skills required. The transformation of the German economy towards a digital, green economy can only succeed with the necessary skilled workers. Already today, there is a shortage of suitably qualified professionals in many sectors of the German economy, both professionally skilled and academics. Demographic change will exacerbate these bottlenecks. Energy transition-related occupational groups, such as technical and IT professions and construction professions, are also affected.

Social situation, including just transition aspects

It is important for the Federal Government that no one is left behind in the transformation process and that a just transition to net-zero greenhouse gas emissions can be achieved. When designing energy and climate measures, the Federal Government therefore always takes into account the social dimensions of its action. This is because the transformations can only succeed with the support of the entire population. The affordability of, for example, energy services, food or housing must always be guaranteed for all sections of the population. For this reason, the Federal Government is supporting citizens in their transformation through a

⁴Other studies also examine the economic impact of climate policies. By comparison, UBA (2024 d) represents the concrete set of measures adopted in Chapters 4 and 5.

number of current support measures.

The National Emissions Trading System (NETS) for heating and transport (BEHG) has shown that the relative burden of this low-income households is higher than that of high-income households (Federal Government 2022). At the same time, this is counterbalanced by a major remedial measure: By abolishing the EEG-surcharge, lower income groups benefit more than upper income groups in relation to income. The early reduction to zero in 2022 and the definitive phase-out of the EEG-surcharge in 2023 will thus greatly relieve the burden on household consumers.

Distributional effects also need to be taken into account in the transition of the nETS to ETS2 in 2027, especially with regard to lower and middle income groups. In addition to national measures, the European Social Climate Fund will have a special role to play here. The Federal Government will ensure that the funds earmarked for Germany will support the transformation of the target groups defined in Regulation (EU) No 955 (2023) from 2026. The updated NECP sets the policy framework for the German Social Climate Plan. In the German Social Climate Plan, the Federal Government will present a coherent package of national measures consistent with the NECP to address the impact of carbon pricing on disadvantaged groups, thereby ensuring affordable heating, cooling and mobility, while contributing to the achievement of Germany's and the Union's climate targets. The Federal Government will therefore ensure the coherence of the two plans and the analytical assumptions and projections on which they are based.

The new funding guideline 'Federal Support for Efficient Buildings – Individual Measures (BEG EM)' introduced, for the first time, an income-based component in renovation support at the beginning of 2024: Owner-occupiers with taxable household income up to EUR 40,000/year receive an income bonus of 30 % for the exchange of heating. In addition, owner-occupied owners with taxable household income up to EUR 90,000 per year can benefit from a subsidised supplementary loan for restructuring measures.

The Carbon Dioxide Cost Allocation Act regulates the allocation of CO₂ costs between tenants and landlords. The aim is to provide incentives on both sides of the lease: energy-efficient behaviour for the end-of-tenant and investments in climate-friendly heating systems and/or energy renovations for the renter. To this end, CO₂ costs will be calculated in the case of:

Residential buildings divided according to the energy quality of the rented building. Tenants in buildings with poor energy renovation will be relieved of the burden. This relief is expected to materialise for the first time in 2024 when the operating costs for the first accounting period covered by the Carbon Dioxide Cost Allocation Act are carried out in 2023.

With the entry into force of the Housing Benefit Plus Act, the Federal Government has also implemented the most comprehensive improvement in housing benefits so far. The Federal Government has thus created the legal basis to relieve lower-income households in Germany even more of the burden of increasing housing and heating costs. The reform focuses on increasing the entitlement to housing benefits and extending the scope of the housing benefit, introducing a heating cost component, a climate component and an increase in the general level

of benefits.

One measure that continues to benefit lower income groups is the promotion of the so-called electricity savingcheck. This measure provides advice and financial support to low-income households on electricity and heating savings. As part of the process of implementing the requirements of the EU Directive on the internal market for electricity (Directive (EU) 2019/944), it is intended to find a long-term solution to address issues relating to energy supply disruptions due to non-payment of electricity or gas bills. Adjustments to the Electricity Supply Regulation and the Gas Basic Supply Regulation provide, for a limited period until the end of April 2025, that consumers may request a suspension of the monthly instalment agreement for up to three monthly instalments during the period of an exemption agreement, provided that they inform the basic supplier in a textual form before the start of the period concerned.

The extent to which people participate in and benefit from energy transition and transformation measures also varies from region to region. For example, residents of rural regions and towns and cities are affected in various ways by the necessary transformation in the energy, transport, buildings and agriculture sectors. For example, rural households often rely on the car in current public transport structures, which means that the transition to climate-friendly e-mobility can be very costly, especially for low-income households. Transport measures address pressures on mobility, which affect people in rural areas in particular.

The strong development of renewable energies is also more visible in rural areas than in cities. For lagging regions, structural change offers challenges but also opportunities. Opportunities exist in the often rural areas, for example through land availability that can be used, for example, for renewable energy production, which in turn can be an economic advantage of location. In recent years, and also against this background, there have been some successes in less-favoured areas.

In terms of jobs, opposite effects can be observed in structurally weak regions: On the one hand, as a result of the transformation, workers are freed up in certain areas, and on the other hand, as a result of demographic change and as a result of migration, the shortage of skilled workers tends to increase. In principle, lagging regions, which often also face specific structural challenges, are likely to be increasingly affected than structurally strong regions by ageing societies and skills shortages in the coming years and decades. Against this background, the Federal Government and the Länder have also increased the focus on soft location factors in the reform of the joint task to improve the regional economic structure (GRW), adopted in December 2022. Increased funding opportunities in the area of regional services of general interest should, in addition to existing measures to create and safeguard jobs, help regions to become more attractive not only to businesses but also to employees. With the reform, the Federal Government and the Länder aim to make the GRW an even more effective tool for shaping regional transformation.

To this end, the GRW's target system has been extended, which in the future no longer aims solely at job creation, but at three main objectives, including accelerating transformations towards a climate-neutral and sustainable economy. In this context, funding opportunities to accelerate the transition towards a climate-neutral and sustainable economy have been

expanded.

Further reforms in the area of regional structural support, in particular the further development of the overall German support system for less-favoured regions in this legislative period, are also intended to further improve the sustainability of structurally weak regions.

Social monitoring of climate protection is also intended to analyse the distributional effects of climate protection measures in the future as part of the development of measures and to design measures as socially as possible.

Rented dwellings

As the rules introduced by the second amendment to the Building Energy Act also apply to rented buildings, they have consequences for renting and renting. In order to address these properly, changes have also been made to housing rental law. The already existing possibilities for an increase in rental rents have been added. Under that provision, a rent increase may be made after the installation or installation of a heating system which meets the requirements of the Building Energy Act. If, in principle, this modernisation measure satisfies the conditions for subsidies from public households and the landlord benefits from the support, the rent may be increased by 10 % of the costs incurred for the apartment less the third-party resources used. If the landlord or the Vermie ter does not receive any support, a percentage of 8 per cent will apply. The aim is to incentivise climate-friendly modernisation through the use of renewable energies and increase energy efficiency in the operation of heating systems. At the same time, in order to protect tenants, a special capping limit was added for the modernisation rent increase with the installation or installation of a heating system. The monthly rent may therefore not increase by more than EUR 0.5 per square meter within six years. In the case of a 100 square metre dwelling, the maximum increase is therefore EUR 50 per month.

Environmental and health impacts,

Existing and planned policies and measures are expected to have environmental and health-reducing effects and synergies for a sustainable energy sector. At the same time, adverse environmental and health effects should be largely excluded from further development of renewable energies and technological developments.

Energy conversion processes remain responsible for a large proportion of air pollution in Germany. In addition to greenhouse gases, air pollutants are released in particular in all sectors burning fossil and biogenic fuels. The energy sector's material contributions to the environment also have an impact on human health. For example, nitrogen dioxide (NO₂) as a by-product of processes in combustion plants and internal combustion engines is an irritant gas harmful to the respiratory tract, which increases the irritation of other pollutants, so that respiratory or cardiovascular disease can occur. Fine dusts also have a negative impact on human health. Decarbonisation measures are reducing these emissions and thus the pressures on people and nature in many areas.

Furthermore, the most efficient use of raw materials and sustainable land use make a

significant contribution to climate change mitigation and biodiversity protection. This is because the extraction, processing and transport of energy sources and energy installations, including pre-chains, involves the use of land. The task is to minimise this land use and avoid permanent degradation of soils and loss of land for other uses and uses. The aim is to ensure that the development of renewable energies is compatible with nature and, as far as possible, that it is kept out of areas of value for nature conservation. This requires smart planning and management that identifies suitable areas and excludes unsuitable areas.

Accelerating the roll-out of renewable energy, in particular the overriding public interest given to renewables, as well as changes in species protection (see section 3.1.2 above: Renewable Energy Act, implementation of the EU Emergency Regulation) create pressures on nature and environmental protection, which are mandatory from

Need compensation. This includes, in particular, the implementation of species support programmes. The relevant provisions of the Renewable Energy Act apply until electricity generation in Germany is almost neutral from greenhouse gas emissions, while the provisions of the EU Emergency Ordinance only apply for a transitional period.

1.3. Overview of investment needs

1.3.1. Existing investment flows and forward investment assumptions with regard to the planned policies and measures

In order to make the energy transition a success, while providing modern and efficient infrastructure, more investment is needed in the coming years.

In order to achieve the climate objectives, Germany is also committed to aligning financial flows with low greenhouse gas emissions and climate-resilient development in order to implement the third long-term objective of the Paris Agreement set out in Article 2.1.c. The operationalisation of this objective is necessary, on the one hand, to channel the necessary financing towards the transformation of a greenhouse-neutral development and, on the other hand, to put an end to climate-damaging financing.

Over the past two decades, the energy sector has already made significant investments in transforming the energy system. However, households and businesses in Germany have also made significant investments in areas of final energy demand.

The energy sector includes the supply of fuels, the operation and maintenance of energy generation, storage and distribution facilities, and the trading of final energy. This refers to both fossil fuels and increasingly renewable energy sources. More than EUR 30 billion were invested in these energy sectors in 2021 (GWS 2023). Investments to decarbonise electricity and heat accounted for the bulk of this. Lower shares related to investments in infrastructure for the distribution of final energy (electricity, gas, heat), storage (gas, electricity, heat) and fuel supply.

Investments in the area of final energy demand are mainly related to heating and transport. Expenditure on energy renovation of buildings is an important factor in this respect. It is estimated that EUR 202 046.5 billion was invested in (BMWK 2023). Energy renovation of buildings is one of the key energy efficiency measures; Investments in other areas of energy efficiency have so far been incomplete.

Reaching net-zero greenhouse gas emissions in Germany in 2045 entails significant additional investments. A precise and comprehensive assessment of investment needs across all sectors poses a number of methodological challenges; the estimates are subject to a number of uncertainties. The Federal Government itself does not currently carry out such saturation; however, it monitors the analyses and studies carried out by third parties on the matter, without taking on board the results of the study as a whole.

The projected investment costs for the hydrogen core network, which is expected to be generated by the target year 2032, will be around EUR 19.7 billion, as requested by the transmission system operators in July 2024.

In addition to such detailed sector-specific assessments of the market players involved, there

are various model-based analyses that either look at investment needs mainly on the energy supply side or look at the whole energy system across the board.

The estimates referred to in Chapter 5.2 on behalf of the UBA (2024c, d) examine, across sectors, the additional investments brought about by the measures taken so far (reference scenario; Chapter 4) and the additional measures described. They are based on an increasing annual increase in investment, reaching up to EUR 122 billion in 2022 (scenario of too much measures). Cumulatively over the 2023-2030 period, there is an additional investment of almost EUR 630 in 2022 with current measures (reference scenario) or around EUR 690 in 2022, including planned measures. Investment focuses on the energy sector, accounting for around half of the additional investment, followed by the building sector, with a share of around one third, and industry with around one-seventh. On the other hand, relatively little additional investment is being made in the transport sector.

Other recent studies sometimes identify higher (sectoral) investment needs, e.g. before 2023 or after

Take into account 2030 or, contrary to UBA (2024 d,e), suggest broader measures that are sufficient to achieve climate neutrality in 2045. In the broad direction, however, the studies confirm the magnitude of UBA.

(2024 d,e). Some studies show that on the energy supply side, increasing additional investment is taking place annually, especially until the middle of the next decade, and then slowly decline, after the foundations for climate neutrality in 2045 have been laid. On the other hand, more investment in the consumption sectors, especially in the building sector, remains at a high level for a longer period.

There is no detailed and complete description of the investment effects of all existing and planned measures; expenditure is planned for individual support measures. Similarly, at present, it is not possible to indicate all the investment needs of all planned measures, i.e. including investments that have not taken place without climate change mitigation.

Investments under existing and additional measures will be prioritised by households and businesses. Only in individual sectors, such as the public supply of electricity and heat, public authorities are direct investors in the transformation of the energy system. At the same time, a significant amount of financial resources are being provided by the public sector to support private investment. In particular, the overall framework conditions for investment and innovation need to be strengthened.

Apportioning the expected investment needs between private and public investment is subject to methodological challenges. In some cases, a direct assessment of the public share of climate change investments is only possible to a limited extent. The same applies to the volume of future support. No estimates of the volume of public climate investments can be provided here. Relevant public climate investments take place, inter alia, where investments are made by companies that are (major) owned by public entities (municipalities, Länder, Federal Government). In Germany, this mainly concerns the energy production and distribution sector

and also the

Transport sector. There is no private investment in industry and no public investment, apart from sub-support. In the building sector, public housing stock can be a relevant benchmark for public investment. This will be complemented by further energy and climate-related investments by the public administration, including social security and defence. Finally, the importance of public climate investments in the sectors may vary depending on whether climate investments are considered as a whole or additional investments to achieve climate neutrality (2022 forecast).

5.3.11. Sector or market risk factors or barriers in the national or regional context

Investments in climate protection and in a future-proof energy system in Germany cannot be considered in isolation in an overall 'lower space' economically. Planned investments and the implementation of planned policies and measures may be hampered or at least slowed down by possible economic or structural bottlenecks. The continued investment of a significant amount of billions of euros in recent years can be seen as an indication that such risks of shortages have so far not been more relevant. For example, public support programmes, such as the KfW's possible financing constraints on businesses and private houses in particular, do not prevent private sector investment that is (also) economically useful.

Furthermore, sufficient raw materials must continue to be available in order not to restrict the production of key (investment) items for climate change mitigation and energy transition. The same applies to a sufficient number of skilled workers to be able to efficiently implement the planned investments.

In addition, care must be taken to ensure that cross-cutting effects such as rebound effects at the level of energy demand and lock-in effects in certain infrastructure investments limit the efficient implementation of energy transition investments and their effectiveness.

Lack of planning certainty can also hamper investment in climate change mitigation and a future-proof energy system. The Federal Government's climate policy therefore includes, in particular, measures that create planning certainty. These include, in particular, carbon pricing, which is becoming increasingly important as a key instrument in the middle of an efficient mix of instruments. Finally, a key determinant of investment activity is the level of government-regulated price components. Against this background, the federal government had abolished the EEG-surcharge and instead financed the Renewable Energy Act from federal funds.

5.3.11.1. Analysis of additional public finance support or resources to fill identified gaps identified under point ii

In so far as the climate action programme measures are financed by public funding, this is essentially enshrined in the 2024 Climate and Transformation Fund (KTF) business plan. As a result, the KTF remains the central financing instrument for energy transition and climate change in Germany.

The issue of refinancing of electricity generation capacity and grids remains relevant: It is true that the financing of the expansion of renewable energy is guaranteed under the Renewable Energy Act on the Federal Budget. At the same time, answers need to be found on the future design of the electricity market. This concerns the regulation of network charges and the distribution of costs between different consumer groups (including budget support and) and the level of taxes and levies.

Activating private capital for the energy transition is a key challenge. The Federal Ministry of Economic Affairs and Climate Protection is working on tailor-made funding building blocks. Given the huge financial needs, for example, energy companies needed additional capital to obtain the additional loans needed for their investments without over-indebtedness. In this context, blended finance instruments can promote a more marketable risk-return profile and thus broaden the financing base of climate change mitigation investments.

The Länder use significant funding from the European Regional Development Fund (ERDF) to support climate action, some of which exceed the prescribed 30 % of the total budget.

In the coal regions particularly affected by structural change, funding will also be provided by the new EU Just Transition Fund (JTF). The JTF is intended to help mitigate the negative effects of the energy transition by supporting the most affected territories and workers and to promote a balanced social and economic transition. In addition to the established structural funds, EU regions particularly affected by structural change caused by the green transition will thus receive financial support for innovation and competitiveness from the JTF. The JTF contributes to reconciling economy and ecology and enabling socially acceptable support for structural change.

Where planned policies and measures are continued and reinforced on the basis of existing measures, the existing financing mechanisms, such as support for energy renovation of buildings through national public support programmes, are generally also pursued. It is currently unclear to what extent EU financing mechanisms will be used to finance investments needed in Germany in detail.

5.4. Impacts of planned policies and measures described in section 3 on other Member States and regional cooperation at least until the last year of the period covered by the plan, including comparison to projections with existing policies and measures

5.4.1. Impacts on the energy system in neighbouring and other Member States in the region to the extent possible

Electricity

The further development of electricity lines within Germany and with neighbouring countries and the progressive expansion of renewable energies in all European countries will – according to today's assessment – lead to an increasing convergence of electricity systems in Germany and

its neighbouring countries. Cross-regional electricity exchange will help to better integrate volatile electricity generation, especially from wind and PV, into the overall system and thus improve the security of supply situation across the region. At the same time, cross-regional exchange of backup capacities (power plants, storage, load flexibility) also increases the efficiency of the electricity system in all countries.

Gas

Decarbonisation efforts could already lead to reductions in gas use, in particular in natural gas, primary energy and end-energy by 2030. This could be due to falling final energy demand in buildings due to energy renovations and increasing shares of renewables.

5.4.11. Impacts on energy prices, utilities and energy market integration

Energy prices

In principle, it can be assumed that falling demand for fossil fuels as a result of climate action in Germany and Europe tends to lead to falling energy prices. At the same time, increasing demand for hydrogen leads to rising prices. The impact of national measures on international fuel markets is rather small.

There is a somewhat stronger impact on electricity prices, in particular on electrical neighbours. A key measure of climate protection in the energy sector is the phase-out of coal-fired electricity generation. At the same time, renewable electricity production is increasing. With high EU ETS prices, an increasing share of renewables in gross electricity consumption tends to decrease in the long term

Wholesale prices domestically and in other Member States. To the contrary, the strong roll-out of renewable energies planned in neighbouring countries also reduces the domestic wholesale price. As procurement costs play a central role in the level of retail electricity prices, there is a direct impact on consumers. The evolution of future electricity prices is, inter alia, shaped by electricity demand as a result of the implementation of stronger sector coupling in heat and transport.

Utilities

The Federal Network Agency regularly monitors security of supply in the field of wired supply of electricity and natural gas. The latest report of February 2023 shows that the current plans of the Federal Government continue to ensure a high level of supply of electricity between 2025 and 2031 (including when coal is phased out in 2030). The Federal Network Agency has based its analysis on the Federal Government's ongoing plans for the transformation of the electricity system. These include: Renewable energy will be developed in line with the objectives of the amended Renewable Energy Act and the amended Wind-on-See Act – by 2030, the generation capacity of onshore wind, wind at sea and photovoltaics will be increased to 360 GW. According

to the network development plan, the transmission and distribution networks will be upgraded. According to the report, if these targets are met, the electricity system is even so robust that security of supply would continue to be ensured if 10 gigawatts (GW) of generation are less in the market. The progressive integration of European electricity markets contributes to security of supply.

Energy market integration

A key point in the integration of the energy market is the further development of trading capacity between Member States. The direct and indirect actions on grid expansion envisaged in the Climate Action Programme will provide the basis for further intensification of electricity trade with the electricity neighbouring countries. Increasing cross-border trade helps to better integrate renewables into the electricity system, manageable

Make more efficient use of capacities and flexibility options and harmonise wholesale electricity prices. This will reduce electricity system costs in all countries. The energy mix of German electricity imports reflects the energy mixes of the surrounding countries from which Germany purchases electricity. It contains varying shares of electricity from renewable sources (wind, solar, hydro, bioenergy) and conventional energy sources (in particular coal, natural gas and nuclear energy) depending on the market situation. The latter may change proportionally due to reduction pathways in some neighbouring countries.

5.4.111. Possible impact on regional cooperation

Electricity

The importance of regional cooperation is expected to increase in the electricity system. Indeed, the more interconnected national electricity systems are, the more important is regular exchanges between states at regional level. On the one hand, this serves to increase the exchange of information than would be possible at the pan-European level. Secondly, specific regional aspects can be better addressed and appropriate solutions can be found. And third, in regional cooperation, new innovative approaches to the operation of the electricity system that are indispensable in a fundamentally changing system can be explored. This means that common learning curves can first be organised at regional level before the tested measures become the European standard, if necessary.

Gas

Germany and many of its neighbouring countries are engaged in intensive efforts to decarbonise the remaining gas needs. This may mean that today's pipeline infrastructure, if it is to be used for hydrogen in the future, must also be examined and, if necessary, upgraded across borders for the inclusion of hydrogen blends. Other pipelines could be entirely repurposed for hydrogen transport. This will require extensive bilateral and regional coordination in order to achieve the corresponding cost-effective upscaling.

In the hydrogen core network application submitted by the transmission system operators to the

Federal Network Agency in July 2024 (see <https://www.bundesnetzagentur.de/DE/Fachthemen/Elektrizitaetundgas/hydrogen/corenetwork/start.html>), include potential conversion lines, i.e. pipelines that are currently still used for the transport of natural gas and are being switched to hydrogen operations, as well as new construction lines. The aim is for pipeline conversions to account for around 60 % of the total length of the hydrogen core network and around 40 % of new lines. The core network includes hydrogen pipelines to be put into operation successively by the target year 2032. It is important to ensure security of supply of natural gas at all times in the transition process and that there are no bottlenecks in the supply of natural gas due to hydrogen switches. To this end, so-called natural gas amplification measures are necessary to a small extent, which are to be implemented in a synchronised manner.

Petroleum

This shift away from oil consumption in heating has led, on the one hand, to the development of environmentally friendly fuel technologies and, on the other hand, the need to develop new potentials such as “Power to Heat” or for new fuels in the future (e.g. E-fuels). At the same time, the importance of regional/international cooperation will increase. Cross-border cooperation will be highly relevant, especially in the context of the development of new technical fuel use systems and fuel developments in the future. Developing solutions for new heating systems or propulsion systems at national level is sufficient as long as these models of thinking are discussed at laboratory level. If developments become market-ready, international cooperation will be essential to establish itself on the market.

The electrification of the transport sector will in the future lead to a reduction in fuel demand, putting pressure on the European refinery economy. It is important to ensure that security of supply is maintained during this transformation process.

5.5. Contribution of planned policies and measures to the achievement of the Union’s climate-neutrality objective set out in Article 2(1) of Regulation (EU) 2021/1119.

Under the Federal Climate Protection Act (KSG), as amended on 18 August 2021, Germany committed to achieving net-zero greenhouse gas emissions by 2045 and a negative net emissions after 2050. In line with these objectives, the Federal Climate Protection Act provides for a

Emission reduction trajectory from 2021 up to and including 2040; the Federal Government is expected to present a legislative proposal setting the annual reduction targets for the years 2041 to 2045 by 2032 at the latest.

Compliance with the trajectory under the KSG shall be reviewed annually; if, in two consecutive cases, if the trajectory is not met, the Federal Government is obliged to adopt additional mitigation measures.

The measures included in the 2023 Climate Action Programme largely bridge the gap to the 2030 climate target identified in the 2021 projection report, with consistent implementation of

the measures. A reduction contribution of 65 % in 2030 compared to 1990 has therefore come into reach for the first time. The 2024 projection data show that the 2030 climate targets are in principle achievable. At the same time, they show the risks and uncertainties for achieving the objectives. This was also developed by the Expert Council on Climate Issues in its special report of 3 June 2024.

In addition to the trajectories, Section 3a KSG sets a target for the expansion of natural sinks. The Federal Government's 'Natural Climate Action Programme' (ANK), adopted in March 2023, is the Federal Government's key instrument for achieving the objectives of Section 3a(1) KSG. ANK's actions are subject to regular monitoring and will be adapted if new knowledge on the development of the sector or the effectiveness of the measures so requires. The ANK contains corresponding requirements for the evaluation planned for the first time in 2025 and, if necessary, for the continuation of the programme. In particular, the evaluation shall take into account trends in emissions balances in the LULUCF sector. The

Review and, if necessary, adjustment will be carried out every two years on the basis of the latest projection report.

Bibliography – Analytical part of the NECP

BDEW (2024) BDEW Electricity Price Analysis February 2024. [www.bdew.de/service/daten-und-grafiken/bdew- Electricity Price Analysis /](http://www.bdew.de/service/daten-und-grafiken/bdew-Electricity-Price-Analysis/) BDEW Gas Price Analysis February 2024. [www.bdew.de/service/daten-und-grafiken/bdew- Gas Price Analysis/](http://www.bdew.de/service/daten-und-grafiken/bdew-Gas-Price-Analysis/)

BMWK (2023) Energy Efficiency in Figures.

[https://www.bmwk.de/Redaktion/DE/Publikationen/Energie/energieeffizienz-in-zahlen-2022.pdf? __blob=publicationFile &v=7](https://www.bmwk.de/Redaktion/DE/Publikationen/Energie/energieeffizienz-in-zahlen-2022.pdf?__blob=publicationFile&v=7)

BMWK; BMF (2023): Macroeconomic potential output and business cycle components, data bases and the results of the Federal Government's estimates. Updated: Federal Government autumn projection of 11 October 2023, 2023.

[www.bmwk.de/Redaktion/DE/Downloads/G/gesamtwirtschaftliches-produktionspotenzial- Autumn Projection-2023.pdf](http://www.bmwk.de/Redaktion/DE/Downloads/G/gesamtwirtschaftliches-produktionspotenzial-Autumn-Projection-2023.pdf)

BMU (2021) GreenTech made in Germany 2021 Umwelttechnik-Atlas for Germany.

www.rolandberger.com/publications/publication_pdf/roland_berger_greentech_atlas_2.pdf

BNetzA (2023) The electricity market in Q1 2023. Wholesale electricity price decreased.

www.smard.de/page/home/topic-article/209944/210326

BNetzA/BKartA (2023) Monitoring Report 2023 Monitoring Report pursuant to Section 63(3) in conjunction with Section 35 EnWG and Section 48(3) in conjunction with Section 53(3) GWB.

[https://data.bundesnetzagentur.de/Bundesnetzagentur/SharedDocs/Mediathek/Monitoringberichte/Monitoringbericht Energie2023.pdf](https://data.bundesnetzagentur.de/Bundesnetzagentur/SharedDocs/Mediathek/Monitoringberichte/Monitoringbericht-Energie2023.pdf)

DPMA (2021, 2022): Annual report 2021 www.dpma.de/digitaler_jahresbericht/2021/jb21_de/patente.html#patente_2;

2022 Annual Report www.dpma.de/digitaler_jahresbericht/2022/jb22_de/patente.html#patente_2

DPMA (2024): A fresh wind in renewable energy innovation. Press release of 26 April 2024

www.dpma.de/service/presse/pressemitteilungen/25042024/index.html

EC – European Commission (2022): EC – European Commission. Recommended parameters for reporting on GHG projections in 2023, Version after consultation of WG2 under the Climate Change Committee on 10 March 2022, sharing of draft recommendation on 30 March 2022 and consultation of National Experts designated by members of WG2 on 26 April 2022.

GWS (2023) Economic indicators of the energy system, production, investment and employment. GWS Research Report 2023/04

<https://papers.gws-os.com/gws-researchreport23-4.pdf>

Forecasts (2022): Green Finance's contribution to achieving climate neutrality in Germany. Public share of climate investment. Short study commissioned by Kreditanstalt für Wiederaufbau. Basel.

<https://www.kfw.de/PDF/Download-Center/Konzernthemen/Research/PDF-Dokumente-Studien-und->

[Materials/Prognos Short study Green Finance AnteilOeffentlich.pdf](#)

Association of Science Statistics (2023) facts – Facts and figures from science statistics Research and Development in the Economy 2021. www.stifterverband.org/sites/default/files/2023-04/fue-facts_2021.pdf Association of Science Statistics (2024) – Facts and figures from science statistics Research and development in the economy 2022. www.stifterverband.org/sites/default/files/2024-04/fue-facts_2022.pdf

UBA – Federal Environment Agency (ed.) (2024a): Greenhouse gas projections 2024 – results compact. <https://www.umweltbundesamt.de/publikationen/treibhausgas-projektionen-2024-ergebnisse-kompakt>

UBA – Federal Environment Agency (ed.) (2024b): Mendelevitch, R.; Repenning, J.; Matthes, F.C.; Deurer, J. GreenhouseGas projections for Germany – Framework data. Eco-Institut; IREES, Dessau-Roßlau. <https://www.umweltbundesamt.de/publikationen/treibhausgas-projektionen-2024-fuer-deutschland>.

UBA – Federal Environment Agency (ed.) (2024c): Harthan, R. Förster H., Borkowski, K. Sibylle Braungardt, Brugger, H.Fleiter, T. Mandel, T., Deurer, J. Steinbach, J., Osterburg, B., Fuß, R. Rock, R. Technical Annex of the 2024 greenhouse gas projections for Germany (projection report 2024). Eco-Institut; IREES. Dessau-Roßlau. <https://www.umweltbundesamt.de/publikationen/technischer-anhang-der-treibhausgas-projektionen>

UBA – Federal Environment Agency (ed.) (2024d): Schumacher, K.; Appenfeller, D.; Cludius, J.; At Wieden, M.; Box, P.; Kreye, K.; Görz, W.K.; Jansen, L.L.; Loreck, C.; Förster, H.; Harthan, R.; Sievers, L.; Grimm, A. et al. Socio-economic impact assessment accompanying the 2023 Projection Report (Climate Change, 17/2024). Eco-Institut; Fraunhofer ISI; IREES. Dessau-Roßlau. <https://www.umweltbundesamt.de/publikationen/sozio-oekonomische-folgenabschaetzung>,

UBA – Federal Environment Agency (ed.) (2024e): Schumacher, K.; Appenfeller, D.; Cludius, J.; At Wieden, M.; Box, P.; Kreye, K.; Görz, W.K.; Jansen, L.L.; Loreck, C.; Förster, H.; Harthan, R.; Sievers, L.; Grimm, A. et al. Socio-economic impact assessment accompanying the 2024 Projection Report. Eco-Institut; Fraunhofer ISI; IREES. Dessau-Roßlau. In preparation.

Measures to: Transposition of Article 8 of Directive 2023/1791

Subject to further assessment, the Federal Government of the Federal Republic of Germany hereby submits to the Commission a preliminary notification of the planned transposition of Article 8 of Directive 2012/27/EU of the European Parliament and of the Council of 25 October 2012 on energy efficiency (as amended by Directive (EU) 2023/1791) (hereafter EED). The notification shall contain the following information in accordance with point 5 of Annex V to the EED and Annex III to Regulation (EU) 2018/1999:

- A preliminary quantification of the savings target for the Federal Republic of Germany in accordance with Article 8(1)(b) EED (Section 1);
- A description of the possible use of the options provided for in Article 8(2) EED (Section 2);
- The preliminary identification of policy measures referred to in Article 11 EED, including their respective cumulative end-use energy savings over the period 2021-2030, as well as the further methodological explanation of that assessment (Section 3).
- Information on the calculation methods used (section 4)
- and measures and systems to verify and monitor savings (section 5).

The corresponding requirements in Article 8 and Annex V EED and Annex III to Regulation (EU) 2018/1999 were taken into account when estimating the cumulative end-use energy savings resulting from the measures.

The planned implementation may be subject to change as a result of future decisions by the Federal Government and the Bundestag [Lower House of Parliament]. In particular, the Federal Government will communicate other instruments and measures relevant to compliance with Article 8(1)(b) EED in a timely manner, thereby ensuring that the Federal Republic of Germany will achieve the savings target under Article 8 EED. These may consist, inter alia, of other existing policy measures to increase energy efficiency. This may also include the notification of additional measures. The Federal Government will also inform the European Commission of any adjustments in the context of its reporting obligations under the Governance Regulation.

1. Calculation of the amount for the whole period from 1 January 2021 to 31 January 2021 Energy savings obligations to be achieved on December 2030

a) annual final energy consumption averaged over the last three-year period prior to 1 January 2019

The basis of calculation for the determination of the savings target referred to in point (a) of Article 7(1);

b) EED is based on the average final energy consumption of the Federal Republic of Germany for the years 2016 to 2018 based on EUROSTAT's figures on final energy consumption.

- Final energy consumption in 2016: 216,87 Mtoe (9 079 PJ)
- Final energy consumption in 2017: 218,62 Mtoe (9 153 PJ)
- Final energy consumption 2018: 215,17 Mtoe (9 009 PJ)
- Average annual final energy consumption for 2016-2018: **9.081 PJ/216,89 Mtoe**

b) Is the total cumulative energy savings in final energy consumption to be achieved in accordance with point (b) of Article 8(1) of Directive 2012/27/EU [in ktoe]

The savings target under Article 8(1)(b) EED is therefore estimated at 5 757.15 PJ or 95.46 Mtoe. This results from the following breakdown:

	Percent in PJ		in Mtoe
2021-2023	0.8	1961,427	46,84789
2024-2025	1,3	1534,635	36,65413
2026-2027	1.5	1225,892	29,27993
2028-2030	1.9	1035,198	24,72527
Overall		5757,153	137,5072

c) Data and sources used for the calculation of final energy consumption:

Final energy consumption figures are based on Eurostat data²⁵. In Eurostat's database, the indicator tracking progress towards the targets is coded 'FEC2020-2030' and called 'Final energy consumption (Europe 2020-2030)'.

2. Use of the options provided for in Article 8(6) and (8) of Directive (EU) 2023/1791:

The German Government does not currently intend to make use of the options provided for in Article 8(2) EED.

3. Policy measures to achieve the energy savings referred to in Article 8(1) of Directive (EU) 2023/1791:

In order to meet the savings target of 5 757.2 PJ or 137.5 Mtoe under Article 8(1) EED, the Federal Government chooses to implement alternative policy measures under Article 10 EED. A combination of existing measures and measures to be adopted will be used.

The Federal Government reserves the right to notify the Commission of further measures to achieve the objectives set out in Article 8 as soon as they are decided upon.

a) Overview of expected cumulative end-use energy savings for the period from 1 January 2021 to 31 January 31 December 2030

The following table provides an overview of the existing and planned alternative measures under Article 10 EED and the expected cumulative end-use energy savings for the period from 1 January 2021 to 31 January 2021. December 2030:

Title of action	Object	Expected cumulative final energy savings 2021-2030 in ktoe ⁵
Energy Efficiency Act – Introduction of EMS	The Energy Efficiency Act obliges companies with an energy consumption of more than 7.5 GWh to introduce an EMS. This is in part anticipating the implementation of the EED, which provides for the mandatory introduction of EMS from an energy consumption of 85 TJ (~24 GWh).	336
Energy Efficiency Act §11 Climate neutral data centres	The new Energy Efficiency Act obliges public authorities to save more energy for energy-intensive businesses and data centres. Climate change mitigation and energy transition can only be successful if energy consumption is permanently reduced. The law was adopted on 18 November 2023 in:	446

⁵ Net effects, taking into account deadweight, anticipated, spill-over, structural and rebound effects. At individual action level, taking into account interactions between measures according to the individual interaction factors listed in Section 4e.

	<p>Entered into force. §11 sets out the requirements for data centres. On the one hand, data centres that started operations before 1 July 2026 must be operated in such a way that they achieve an energy consumption effectiveness of less than or equal to 1.5 from 1 July 2027 and an energy consumption effectiveness of less than or equal to 1.3 from 1 July 2030. Data centres that shall start operation from 1 July 2026 have an energy consumption effectiveness of less than or equal to 1.2 and an additional share of at least 10 % of reused energy. The share of energy reused shall meet additional requirements for data centres that will become operational later.</p>	
Module 2 of the Federal support for energy consultancy for non-residential buildings, installations and systems	Support for energy advisory services for non-residential buildings in existing and new buildings	493
Federal Support for Efficient Buildings (BEG) – Stock	The Federal Support for Efficient Buildings (BEG) aims to increase the energy efficiency of buildings and support the switch to renewable heating. The programme provides financial support for renovation measures that improve the energy quality of residential and non-residential buildings and for the replacement of heating systems. It covers various funding areas, including individual measures on the building envelope, plant engineering, heating optimisation, and technical planning and follow-up. The support is accessible to both private and institutional investors. The impact of federal support for efficient buildings with the design for the year in question is estimated. From 2024 onwards, the effects for the BEG with effect from 1 January 2024 will be used. Support for new buildings in the BEG is considered in a separate template.	18100
Federal Support for Efficient Buildings (BEG) – New Construction	Under KfW support with product number 297/298, the Federal Government grants subsidies in the form of subsidised loans to reduce the environmental impact and raise the sustainability standard when creating new ones. Housing and construction of new residential buildings. The 300 programme supports income-dependent Residential property in the new construction area for families – WEF. The Programme 299 addresses the construction of new Non-residential buildings and programmes 498.499 are targeted at	899
Tax incentives for energy Renovation of buildings (Section 35c EStG)	Tax incentives are permitted in the case of individual measures (such as replacement of heating or insulation of individual components of the shell surface of a building) in own dwellings and residential buildings used for their own residential purposes. Tax incentives are provided both for individual measures and for the possibility of comprehensive renovation (overall renovation) achieved through several individual measures, where appropriate. Since 1 January 2020, the tax incentive has been in operation as an alternative to federal support for efficient buildings (BEG).	1228
65 % renewable energy (RES) requirement for new	Requirement to use 65 % renewable energy (RES) in newly installed heating systems (Section 71 GEG). The estimates	8764

installed heating systems (Section 71 GEG)	refer to the amendment adopted by the Bundestag on 9 September 2023.	
JIT amendment – rest	Conditional renovation obligations of the current JIT (rehabilitation to reference building*1,4); Reference: ‘Switching off’ of the conditional reorganisation obligations of the JIT; however, it is assumed that in around half of all renovation cases (i.e. autonomously) energy-related modernisation will nevertheless take place to the minimum level currently in force.	9458
Heating label	Since the beginning of 2016, the national efficiency label informs consumers about the respective efficiency status of their heating waste. At the beginning of 2016, the appliances were labelled voluntarily by chimney sweeps, heating technicians or energy consultants under existing contractual relationships. Since the beginning of 2017, district chimney sweeps have been obliged to relabel the appliances that have not yet been awarded as part of the regular fireplace show. Heating owners must tolerate this labelling. On labelling, you receive an individual assessment of the efficiency class of the heater, an information brochure containing additional information on the Federal Government’s advice and support in the heating sector and oral information on the energy efficiency of the heater. This label and the information provided are intended to encourage heating owners to provide energy advice or replace the old installation if necessary.	151
Energy consultancy for residential buildings	The federal support for energy advisory services for residential buildings (EBW) supports energy consultations carried out by experts.	5431
Ensikumav	Energy Security of Supply Regulation on short-term effective measures: Period of application from September 2022 until 15 April 2023; Short-term measures, such as lowering the minimum ambient temperature in workplaces by one degree Celsius, setting the maximum temperature in public workplaces to 19 degrees, and prohibiting heating for private swimming pools.	181
Ensimimav	Regulation on energy security of supply on medium-term effective measures: Ensimimav sets requirements for overhaul and optimisation of heating systems and for the implementation of economic efficiency measures in companies.	3415
‘Municipal networks’ funding priority in the municipal guidelines	The overall objective of the Directives is to unlock sustainable, economic and easy-to-use energy and resource saving potentials by promoting cooperation between municipalities, with a view to permanently reducing greenhouse gas emissions and resource consumption in municipalities. The use of external network, energy and/or resource experts should enable the participating municipalities to identify potential savings and to build municipal networks and implement measures discussed there.	47
Power EfficiencyCheck	The measure has been running from December 2008 until 31 March 2026 under various names (‘Stromspar-Check’, December 2008 – December 2012, ‘Stromspar-Check Plus’, 1.1.2013 – 31.3.2016, ‘Stromspar-Check Kommunal’, 1.4.2016 to 31.3.2019, ‘Electricity Saving Check Act’, 1 April 2019 to 31 March 2022, ‘Electricity savingcheck near you’, 1 April 2022 to 31 March 2023 and ‘Electricity savingcheck – simply heat, water & electricity saving’, 1.4.2023 31.3.2026.) It is planned to continue beyond 2026. The design was partly organised at the various stages.	145

	<p>various. It is assumed that an extension to 2030 will be made within the current profile and scope. The measure includes the continuation of the 'Electricity-saving Check' projects supported by the National Climate Change Initiative since December 2008. The key element is the provision of targeted advice to low-income households by the long-term unemployed who are further trained as 'electricity savers'. The target group is households with a transfer benefit and, since 2016, other households with an income below the attachment threshold. The advice initially concerned only electricity and hot water savings. Since 2019, advice on heating energy saving has also been offered. As part of the advice, households receive energy-saving items free of charge (e.g. LED lights, switchable sockets, water-saving bolts, door blades or sealing bands) that can directly reduce their energy needs and contribute to climate change mitigation. Since 2013, households have also received, under certain conditions, a subsidy to replace a particularly inefficient old refrigerating appliance for a new class A+++ . In addition, the programme will continue networking activities with the aim of attracting other actors and multipliers to perpetuate and expand, e.g.: Municipalities, other advisory bodies and actors of the 'Social City'. The project will be accompanied by monitoring.</p>	
Federal funding for Electricity, gas & Resource efficiency in the Economy (EEW)	<p>In 2019, the programme 'Federal Support for Energy Efficiency in the Economy' bundled several existing support measures and thus restructured the support for energy efficiency measures in the economy. In addition to a grant and loan variant of the programme, which in turn is divided into several modules, a funding competition is offered in a separate funding guideline. As of 1 November 2021, both funding guidelines were amended. In addition to improved support conditions for off-farm waste heat use, electricity efficiency and SMEs, the new resource efficiency funding area was introduced in both funding guidelines and supplemented in the programme title. The grant and loan variant of the programme also introduced the new support area for transformation concepts (module 5) to help companies plan their decarbonisation strategy. The two directives were further amended in November 2022, with only minor adjustments to individual modules. The amendment of the funding guidelines (grant variant) on 1 May 2023 brought further changes. In addition to further adaptations, this amendment also included the creation of a new Module 6, which would allow small companies to replace fossil-fuelled equipment and equipment with electrical equipment and to supplement the geothermal energy support item in Module 2. With the last amendment in February 2024, funding savings (reduction of funding rates) and facilitations in the application process were made. In addition, the programme has been adapted to the new ex ante GBER.</p> <p>The EEW currently includes the following elements:</p> <ul style="list-style-type: none"> Module 1: Cross-cutting technologies Module 2: Process heat from renewable energy sources Module 3: Measurement, control and control (MSR), sensing and energy management software Module 4: Energy and resource optimisation of plants and processes Module 5: Transformation plan Module 6: Electrification of small enterprises promotion competition 	22017
Promoting energy efficient cooling and	In addition to reducing climate-damaging F-gases, the measure essentially aims at increasing the efficiency of:	219

Air conditioning equipment with non-halogenated refrigerants in stationary	supported installations are above the market average. In particular, the effect of the subsidised waste heat use on final energy savings is relevant.	
Guidelines on the promotion of climate change projects in the municipal environment 'Municipal Guidelines' (CRL) – lighting component of the programme	The measure includes support for the rehabilitation of outdoor and street lighting, as well as indoor and indoor lighting under the municipal guidelines. It is assumed that the measure will continue in a similar form until 2030.	220
Federal support for energy consultancy for non-residential buildings, installations and systems	The federal support for energy consultancy for non-residential buildings, installations and systems consists of a total of three modules. Module 1 supports energy audits for small and medium-sized enterprises that meet the essential requirements for an energy audit within the meaning of Section 8a of the Act on Energy Services and Other Energy Efficiency Measures (EDL-G) and in particular the requirements of DIN EN 16247. Module 2 supports energy advice for non-residential buildings in existing and new buildings, which make it possible to include energy efficiency and renewable energies in the planning and decision-making process and thus realise the efficiency potential at the most individual time. The Contracting Orientation Advice promoted in Module 3 aims at a Contracting model with a contractual savings guarantee.	421
Medium-sized Energy Transition and Climate Change Initiative (MIE)	Support small and medium-sized enterprises from crafts and industry in the field of energy efficiency and climate protection. Another period of the Small and Medium-sized Enterprises Initiative (SMEs) was launched on 1 January 2019, continuing the projects launched and designing new measures, such as the digitalisation of the electronic energy book (e-tool), the development of a business development roadmap for SMEs, the topic of mobility and the targeted integration of energy efficiency into artisanal education and training. The action was terminated at the end of 2023.	68
Energy Efficiency and Climate Networks Initiative	The 'Energy Efficiency Networks' initiative, which since the end of 2014 has been supported by the Federal Government together with industry associations and organisations, has proved to be one of the most successful NAPE measures. In mid-September 2020, the Federal Government therefore agreed with 21 business support associations and organisations and ten cooperation partners to continue the initiative as an 'Energy Efficiency and Climate Networks Initiative'. This second phase is expected to continue until the end of 2025 (objectives: 300-350 new networks, saving 9-11 TWh final energy and 5-6 million tonnes of GHG emissions). The relevant industrial sectors, the energy industry, the trades and commerce are involved in the action alliance. The guiding principle is that the exchange of experience in the network stimulates considerably more or quicker efficiency measures in companies than without them. On average, the networks include 10 companies that set both individual targets and common savings targets at the start of the network. Moderators and expert energy consultants structure and accompany network work.	3301
KfW— Energy efficiency programme for production facilities and processes	The KfW Energy Efficiency Programme aims to implement energy efficiency measures in companies (Production facilities/processes including cross-cutting technologies) by means of subsidised loans. Current conditions: Modernisation investments leading to a specific final energy saving of at least 10 % compared to the average consumption over the last 3 years. In the case of new investments, energy savings are important compared to the industry average.	722

<p>Packages of measures: Promoting more climate-friendly Method of production</p>	<p>This package of measures includes programmes to promote the market uptake of climate-friendly manufacturing processes: Support programme for decarbonising industry (from 2024 federal support for industry and climate protection)</p> <p>The aim is to promote investments to reduce process-related emissions in the area of emission-intensive industries. These will serve both application-oriented R & D and industrial-scale experimentation and wide market uptake of mature or new technologies. Implementation in the funding guidelines on decarbonisation in industry from 2024 onwards on funding guidelines for federal support for the decarbonisation of industry and carbon management (funding guidelines for Federal support for industry and climate protection, BIK). Climate change contracts: The climate contracts will support the decarbonisation process. With the Climate Change Contracts (CCfDs: Carbon Contracts for Difference) to cover the higher costs of innovative climate change technologies through the difference with the CO₂ price. CCfDs target key technologies that are important in the long term but are not yet economically viable at current CO₂ prices.</p> <ul style="list-style-type: none"> - EU Innovation Fund: The EU ETS Innovation Fund supports innovative demonstration projects for climate-friendly technologies. Since 2020, support also includes innovative climate-friendly production processes with a demonstrative character in industry, including CCU and CCS. Overall, the following will therefore be supported: - innovative low-carbon technologies and processes in energy-intensive industries, including products replacing carbon-intensive industries; - Carbon Capture and Recovery (CCU); - Construction and operation of Carbon Capture and Storage (CCS); - innovative renewable energy production and storage. - IPCEI hydrogen <p>Creation of a new Important Project of Common European Interest (IPCEI) on hydrogen technologies and systems. Promoting the uptake of green hydrogen.</p>	<p>2656</p>
<p>Technology Transfer Programme Light Construction (TPP LB)</p>	<p>The programme promotes the substitution of greenhouse gas intensive resources and raw materials, as well as circularity of materials. This is done in 5 programme lines:</p> <ul style="list-style-type: none"> - Technology development to strengthen the German economy in light construction - CO₂-Saving and CO₂sequestration through the use of new design techniques and materials - CO₂- Resource efficiency and substitution savings - Demonstration projects - Standardisation 	<p>2079</p>
<p>Carbon leakage aid under the BECV</p>	<p>With the introduction of national fuel emissions trading, there is a risk of carbon leakage. This means that companies are shifting their production to other countries due to increased costs, which does not save GHG emissions at a systemic level. To avoid this risk, since 2023, it has been possible to apply for aid to partially compensate for the increased costs. However, that aid is linked to the provision of environmental compensation. Within the necessary transformation process of industrial production, the BECV (Regulation on measures to prevent carbon leakage from national fuel emissions trading) aims to establish a link between the intended relief of operating costs from the aid and incentives for the implementation of climate-friendly measures in the investment planning of companies.</p>	<p>417</p>

Federal programme on the Increase in Energy efficiency and CO ₂ — Saving in Agriculture and Horticulture	The Federal programme to increase energy efficiency and CO ₂ savings in agriculture and horticulture supports companies in these sectors to invest in more economical, climate-friendly technologies through financial support. The support programme includes a guideline which provides financial support for 'energy advice', 'investment measures' for improving energy efficiency, reducing CO ₂ emissions and the spread of renewable energies, district heating and cooling. "Knowledge transfer and information actions" and "research and development" have not been supported since the re-establishment of the KTF.	763
Guidelines on the promotion of electric vehicles (environmental bonus)	From mid-2016 to 17th December 2023, electric vehicles were supported with a purchase bonus, the so-called environmental bonus. Half of the environmental bonus was initially granted by the car manufacturers (own share) and half by a federal grant (federal share). The relevant funding guidelines (Guidelines on promoting the sale of electric vehicles) have been amended several times during the programme period. For example, as of February 2020, the 4th Funding guidelines link the funding rates to the value of the vehicle and support vehicles & EUR 40.000 at a higher rate and collected a funding cap with a vehicle value of EUR 65.000, above which no funding is granted. In June 2020, the 6th Funding guidelines: a significant increase in funding rates by the Federal Government (without an increase in the producer's share) with the introduction of the so-called innovation premium (6. Funding guidelines), which doubled the federal share compared to the producer's share. Under the 9th and last funding lines, the innovation premium had expired and plug-in hybrid vehicles (PHEVs) were no longer supported. For pure battery vehicles (BEV) and fuel cell vehicles (FCEV), the federal subsidy in the last year of the programme was EUR 4.500 for vehicles & EUR 40.000 (EUR 3000 for vehicles above EUR 40.000) and the manufacturer EUR 2.250/1.500. On the 17th December 2023, the programme, initially foreseen until the end of 2024, was frontloaded due to funding problems in the federal budget.	9526
Reduction of the Company car taxation for e-cars by 2030	The beneficiary company car taxation for the private use of battery electric vehicles (a reduction of 75 % quarter of the tax base up to EUR 70.000 gross list price) and Plug in-hybrid or BEV with a gross list price > EUR 70.000 (hardening of the tax base) is extended until 2030. All-electric company cars with 1/4 (BEV, FCEV), PHEV with 1/2 (not more than 50 g CO ₂ /km or minimum electrical range of 60 km (1.1.22 to 31.12.24) or 80 km (1.1.25 to 31.12.30) of the gross list price per month.	450
Support programme for the purchase of electric buses in the public sector Public transport	On the basis of the above-mentioned guidelines, support will be given to the purchase of alternatively powered buses in passenger transport. The focus of the support is on electric propulsion variants.	333
Making train journeys cheaper	VAT reduction for long-distance rail passenger transport from 19 % to 7 % (local rail passenger transport was already 7 % and freight transport remains at 19 %)	216
Introduction of the German tickets	On 3 September 2022, the Coalition Committee decided to introduce a nationwide local transport ticket. Subsequently, in October 2022, the Conference of Ministers of Transport agreed on basic technical and substantive requirements for the introduction of a nationwide local public transport ticket (at an introductory price of EUR 49 per month). The German ticket was introduced on 1 May 2023. For this purpose, the Federal Government provides the Länder with regionalisation funds of EUR 1.5 billion between 2023 and 2025.	330

Funding guidelines for the promotion of commercial and special vehicles with climate-friendly propulsion and associated refuelling and charging infrastructure	Since July 2018, there have been grants for the procurement of alternative powered trucks under the energy-efficient commercial vehicles ('EEN') funding programme. The programme ended on 31.12.2020. The funding guidelines for commercial vehicles with alternative, climate-friendly propulsion and associated operational refuelling and charging infrastructure, which entered into force on 2 August 2021, further increased funding to 80 % of the extra investment costs due to technology. The action will expire at the end of 2024.	72
CO ₂ – Differentiation and extension of the HGV toll	Zero-emission vehicles will benefit from a full toll exemption until the end of 2025. Subsequently, zero-emission vehicles pay only 25 % of the toll sub-rate for infrastructure costs plus the toll sub-rates for the cost of noise and air pollution. Zero-emission vehicles with a technically permissible maximum laden mass not exceeding 4.25 tonnes shall be permanently exempt from tolls. Since 1 December 2023, an additional toll sub-rate for transport-related CO ₂ emissions has been charged with the HGV toll. This is based on a price of EUR ₂₀₀ /CO ₂ . On 1 July 2024, the obligation to pay tolls was extended to heavy goods vehicles with a technically permissible maximum laden mass of more than 3.5 tonnes.	1557
Development of support for efficient trailers	Under the measure 'Extension of support for efficient trailers', the support programme 'Flot renewal programme for heavy-duty vehicles' is designed for pure component support. The cost of smart trailer technologies (ITTs) and CO ₂ reduction additional equipment of a new commercial vehicle (e.g. for aerodynamic attachments, aerodynamic trailers, optimisation of tyre rolling resistance (tyres and axles), optimisation of loading capacity/number of trips, lightweight construction, cranability of the trailer, increased cooling efficiency) will be subsidised. In addition to new acquisitions, support will also be granted for retrofitting projects of existing trailers.	169
Greater emphasis on the CO ₂ tariffs in motor vehicle tax	In order to channel demand more clearly towards cars with reduced emission potential, an even greater consideration of the CO ₂ tariff has been implemented by introducing a progressive CO ₂ tariff in the vehicle tax for ICE cars. Passenger cars with a CO ₂ type-test value up to 95 g/km, starting on 12 June 2020 and ending on 31 December 2020. December 2024 shall be authorised for the first time until 31 December 2024. December 2025 at EUR 30 per year in motor vehicle tax.	179
Energy and electricity tax	The Energy Tax Act and the Electricity Tax Act regulate the taxation of various energy sources (e.g. fuel oil, petrol, diesel, natural gas, LPG, CNG) and electricity. These taxes have an impact on end-users' behaviour towards greater use of energy-efficient technologies and the use of energy in a way that reduces energy consumption, due to their price-inducing effect. Energy and electricity taxes are based on EU harmonised legislation (Directive 2003/96/EC). The Energy Tax Act entered into force in 2006 (then Mineral Oil Tax Act) and the Electricity Tax Act entered into force in 1999. The laws are constantly being adapted (most recently in 2024).	13821
CO ₂ – Pricing for the transport and heat sectors	From 2021, the BEHG introduced CO ₂ pricing for the transport and heat (non-ETS) sectors. The national emissions trading system (ETS) covers emissions from the combustion of fossil fuels (in particular fuel oil, LPG, natural gas, coal, petrol, diesel). Until and including 2025, a fixed price system will be put in place, whereby upstream trading allowances are sold to the distributors or suppliers of the fuels. This creates a reliable price path that allows citizens and businesses to adapt to development. At the same time, the Federal Government is planning to set up a trading platform that allows for the auctioning of allowances and trading.	6070

Aviation tax	Increase in air transport tax from 1.4. In 2020, for intra-European destinations by EUR 5.53 to EUR 13.03, for intermediate distances of up to 6.000 kilometres by EUR 9.58 to EUR 33.01 and for long-distance flights by EUR 17.25 to EUR 59.43.	1815
Overall		116515

b) Description of the measures in accordance with the requirements of points 3.2 and 3.3 of paragraph 3 of Annex III and points (c) – (d) of paragraph 4 of Annex III to Regulation (EU) 2018/1999

A detailed description of these measures and the annual savings they generate in accordance with the requirements set out in points 3.2 and 3.3 of paragraph 3 of Annex III and in points (c) – (d) of Annex III(4) to Regulation (EU) 2018/1999 can be found in the attached Excel sheet. Further technical details may be provided upon request.

c) Measures and share of savings to be achieved in households affected by energy poverty pursuant to Article 8(3)

Measure M23 StromsparCheck and measure M21 Energieberatungen (part VZBV) can also address energy poverty aspects. The Energy Efficiency Check is aimed exclusively at the target group of low-income households and thus makes a significant contribution to combating energy poverty. Low-income households receive targeted advice on electricity and energy savings and are provided free of charge with energy-saving items.

As part of the measures to provide energy advice to households by the consumer centres, which is part of measure M21, all energy advisory services for low-income households are free of charge. The Bundesverband Verbraucherzentrale Bundesverband (Vzbv) offers independent advice to private consumers, which includes in-patient advice, online and telephone advice and on-site advice to consumers at home. Such energy checks can provide advice on different priorities (e.g. electricity and heat consumption, heating technology, use of renewable energies such as photovoltaics, solar thermal). The consumer centres offer addresses all issues related to energy efficiency, energy saving or renewable energies.

The Federal Government is also preparing further measures and updating existing measures to meet the requirements.

The share of savings to be achieved in households affected by energy poverty in accordance with Article 8(3) is currently still under calculation.

4. Calculation method for measures reported under Article 10 of Directive 2012/27/EU (as amended by Directive 2021/1791) (excluding tax measures) (a) Measurement methods used in accordance with point 1 of Annex V to Directive 2012/27/EU (as amended by Directive 2023/1791)

Depending on the measure, different measurement methods will be used depending on the available data. For most of the support measures, the savings presented are based on extrapolations of savings collected and measured by means of evaluations in accordance with Annex V(1)(a) EED.

b) Method to express the energy savings (primary or final energy savings);

The savings of the above measures are presented in final energy.

c) Lifetimes of measures, rate at which the savings decline over time and approach used to take into account the lifetime of savings;

The information on the lifetime of the respective measures can be found in the measures under point 3. If these could be attributed to one of the measures in Annex VIII to the Commission Recommendation on the implementation of the energy savings obligations under the Energy Efficiency Directive³⁵, the lifetimes indicated therein were used. In this case, there is no reference to the source. If no suitable lifespan has been found, it has been defined and justified in the bill of lading. The issue of degradation, i.e. the reduction in savings over time, for example due to wear and tear of the new products/components, does not seem to play a major role in the current state of discussion. There has been no empirical evidence of wear and tear for investment measures at least at the beginning of the lifetime. On 15/03/2019, an expert workshop organised by the European Commission on lifetimes and degradation of savings took place in Brussels. The workshop documentation and the outcome report state that there is currently no scientifically robust basis for developing a methodology that can explicitly take into account the degradation of savings. Against this background, a decreasing rate has not been calculated at this stage, as it would not be statistically robust.

d) Brief description of the calculation methodology including how additionality and materiality of savings are ensured and which methodologies and benchmarks are used for deemed and scaled savings;

The calculation of energy savings is based mainly on the Commission's recommendations of 2 July 2010 (title: Recommendations on measurement and testing methods under Directive 2006/32/EC on energy end-use efficiency and energy services). The bottom-up calculation methods proposed there relate primarily to measures in the fields of buildings and installations and equipment and lighting. They have been adopted by the European Commission as non-binding

proposals or recommendations in order to give the Member States the freedom to adapt the calculation methods in an appropriate manner in accordance with the very different national information and data situations between the Member States. The Commission's recommendations on the calculation of energy savings using bottom-up calculation methods do not cover all areas of action in which energy efficiency measures have been taken. The Commission's recommendations therefore expressly provide that Member States should develop or use additional national bottom-up calculation methods for those instruments for which the Commission has no recommendations on how to calculate the resulting energy savings. This concerns, in particular, instruments and measures in the field of transport and mobility and cross-cutting measures. The Federal Government has made use of this possibility accordingly. In addition, existing evaluations of support measures/programmes were used in cases where they were available in an appropriate manner. Such programme evaluations shall also carry out bottom-up calculation methods. However, they are usually linked to additional empirical building blocks, such as standardised interviews or expert interviews, and can therefore, in principle, provide more accurate estimates of the energy savings achieved through increased effort and associated evaluation costs.

The methods were already included in the 2nd National Energy Efficiency Action Plan of the Federal Republic of Germany (NEAP 2011) used to calculate energy savings induced by measures and detailed in a methodological accompanying document. As a result, these methods were used for the reporting of the further NEEAPs and the notifications on the implementation of Article 7 EED for the period 2014-2020 and were further developed taking into account the requirements of the Annex to the Commission Recommendation on the implementation of energy savings obligations under the Energy Efficiency Directive, Brussels, 13.9.2023, C(2023) 1791 final.

The calculation method used for each measure (calculation formula based on the European Commission's recommendations, national calculation formula or reliance on existing external evaluation) is set out in the measures notes. The net effects are taking into account possible carry-over, anticipation, spill-over, structural and rebound effects. In addition, the interactions between the measures according to the individual interaction factors listed in Section 4e have been taken into account. A description of how additionality of the respective measures is ensured can be found in the methodological notes of the measures presented in section 3 above.

In the case of energy efficiency support programmes, it follows from the requirements of budgetary law, in particular Section 23 of the Federal Budget Code, that measures are in principle not eligible if they could be implemented economically even without funding or if the implementation of the measure is legally prescribed. It follows that the support must be essential for the implementation of a (energy efficiency) measure and thus also minimise possible deadweight effects.

e) Information on how the possible overlaps between the measures and individual actions are addressed to avoid double counting of energy savings;

The Federal Government uses so-called interaction factors (or 'instrument factors') when calculating energy savings effects. These interaction factors are a correction variable to avoid double counting of energy savings. They shall ensure that any double counting (in particular where a single energy saving measure is addressed by a larger set of instruments and programmes) is corrected and that the total amount of energy savings identified is only included once. Energy savings in a given area are allocated pro rata to the measures addressing that area.

The use of interaction factors (or, at the time, 'instrument factors') was already used as a methodological approach in 2. National Energy Efficiency Action Plan of the Federal Republic of Germany (NEEAP 2011) for calculating energy savings induced by measures and presented in detail in an accompanying methodological document. Subsequently, this approach was also used and further developed for the reporting of the further NEEAPs and the notifications on the implementation of Article 7 EED for the period 2014-2020.

For the notified measures, the joint overlap is estimated for each pair of measures. However, this can only be done once all the measures to be notified are known and will be provided accordingly.

f) Where relevant, climatic variations and approach used.

As Germany is relatively homogeneous from a climate point of view, different climatic conditions have not been taken into account or are planned to be taken into account in the notified measures.

Interactions with other measures have already been methodologically taken into account when quantifying the impact on savings

5. Monitoring and review

a) Brief description of the monitoring and verification system and the process of the verification;

In order to ensure that the objectives pursued are actually achieved, financial measures to achieve energy savings are regularly evaluated and monitored by independent external experts, institutes or bodies. In accordance with the requirements of the Federal Budget Code (Section 7(2) of the BHO), they are subject to a check on their success. It

examines the achievement of the objectives, the effectiveness and the efficiency of the measures. A systematic and transparent evaluation is carried out in line with the quality standards of the Deutsche Gesellschaft für Evaluation (DeGEval). Depending on the measure or the specific evaluation design of each measure, energy savings are either calculated directly by the experts or the results of the evaluation are taken into account as a basis for the energy savings calculations of the relevant departments (e.g. taking into account the number of actual funding cases and the measures actually implemented with an energy saving effect). In order to fulfil its statutory tasks, the Federal Office for Energy Efficiency has set up a monitoring and verification system. A structured monitoring template, among other things, collects information on the savings achieved by the alternative measures under Article 10 EED (in the case of actions with financial impact, these are the results of evaluations carried out by independent bodies) from the actors responsible for the measures. Subsequent plausibility checks are carried out to check the completeness and consistency (within a reporting year, compared to standard values of comparable measures and over time) of the data.

b) Implementing public authority and its main responsibilities in charge of monitoring and verification system in relation to the energy efficiency obligation scheme or alternative measures;

The Federal Office for Energy Efficiency (BfEE), set up in the Federal Office for Economic Affairs and Export Control (BAFA), is responsible, on the legal basis of the Energy Services Act³⁷, for monitoring the impact of energy efficiency mechanisms and other public policy measures intended to achieve energy savings for final customers and for preparing these savings for reporting purposes in the context of national and European energy efficiency and savings targets. This includes monitoring and verifying the savings of the alternative measures referred to in Article 10 EED.

c) Independence of monitoring and verification from the obligated, participating or entrusted parties;

Financially effective measures to achieve energy savings are regularly evaluated and monitored by independent external evaluators, institutes or bodies.

d) Statistically significant proportion of energy efficiency improvement measures and proportion and criteria used to define and select a representative sample;

The definition of a statistically significant sample size depends to a large extent on the number of cases considered and on the other context of the measure. Therefore, a universal definition, such as the indication of percentages and case numbers, is not possible, but has to be considered according to the specific context of the measure.

The Federal Ministry of Climate Protection and Economy (BMWK) has developed a methodological guide³⁸, to be taken into account by external evaluators when evaluating efficiency measures and providing a uniform methodology for the ex-post and accompanying evaluation of energy efficiency policy measures. This will therefore also help to ensure the quality of the evaluation results. Depending on the case number considered, the guidance document describes how the observed savings of a statistically significant proportion of energy efficiency improvement measures are evaluated, taking into account a representative sample.

e) Reporting obligations for obligated parties (savings achieved by each obligated party, or each sub-category of obligated party, and in total under the scheme).

In the absence of an energy efficiency obligation scheme, no parties within the meaning of Article 9 EED are 'obliged' in Germany. However, the departments responsible for measures report on the effects of the measures as part of the regular monitoring of savings from efficiency measures.³⁷ Act amending the Act on Energy Services and Other Energy Efficiency Measures (EDL-G).

³⁸ Methodological guide for evaluation of efficiency measures by the BMWK (Project No 63/15 – top-up)

f) Publication of energy savings achieved (each year) under the energy efficiency obligation scheme and alternative measures;

Continuous monitoring and comprehensive monitoring of the implementation of all planned measures and their mitigation effects will be carried out in the continuation of the already established regular reports of the Federal Government 'Monitoring the Energy Transition' and 'Climate Protection Report'.

g) Information on Member State legislation on penalties to be applied in the case of non-compliance;

In accordance with the different nature of the alternative measures adopted by the Federal Republic of Germany under Article 10 of the EED, the possible penalties attached thereto also differ in the event of non-compliance with the respective requirements. For example, a broad distinction can be made between measures in the field of regulatory law and support

measures. In the case of support measures, the funding is paid only after the verification of all the documents to be submitted in the use-of-funds procedure has been completed. In accordance with the general ancillary provisions pursuant to VV No 5.1 to Section 44 of the Federal Budget Code, the applicant is required to keep all documents relevant to the grant for at least five years and, in the event of verification, to submit them. If he does not comply with this obligation, the eligibility condition does not apply retroactively and the funding plus interest may be recovered. In the case of measures where tax or levy privileges are granted, they shall be withdrawn in the event of non-compliance. Infringements of regulatory law are penalised by a fine (e.g. if the requirements of Section 48 GEG (M11) are not met, a fine of up to fifty thousand euros may be imposed).

h) Information on policy measures provided for in the event that progress is not satisfactory.

On the basis of the monitoring carried out by the Federal Energy Efficiency Agency, an annual review of the effectiveness of the measures referred to above is planned. Thus, the Federal Government creates objectivity in achieving its efficiency and climate objectives. To this end, the Federal Government will set a time limit for the Cabinet Committee on Climate Change ('Climate Cabinet') and give it the task of reviewing the effectiveness, efficiency and accuracy of the measures taken on an annual basis³⁹. If unsatisfactory progress is made, the competent minister responsible for the sector that does not meet its statutory targets shall submit an immediate post-control programme to the Climate Cabinet within three months of the confirmation of the emissions data by the Commission of Experts. On this basis, the Climate Cabinet is preparing decisions on how the '2030 Climate Protection Programme', adopted by the Federal Government, will be adapted together to achieve its underlying objectives.

Annex 1: Policies and measures along the five dimensions of the Energy Union

Dimension 1: Greenhouse gas removals

Dimension 2: Energy efficiency

Dimension 3: Security of energy supply

Dimension 4: Internal energy market

Dimension 5: Research, innovation and competitiveness

No.	Measure	Dimension	Last reporting
1	EU Emissions Trading Scheme	1	NECP-R
2	EEG surcharge reduction	1	NECP-R
3	Energy and electricity taxation	1, 2	NECP-R
4	CO ₂ - Pricing for the transport and heat sectors (BEHG)	1	NECP-R
5	Climate and Transformation Fund Act (KTFG)	1	
6	National Climate Action Initiative (NCI)	1	NECP-R

7	Minimum efficiency standards EU Ecodesign Directive	1, 2	NECP-R
8	Energy label – EU Regulation establishing a framework for Energy consumption labelling	1, 2	NECP-R
9	NEC Directive on national Emission reduction commitments for certain air pollutants	1	
10	Municipal heat planning	1	
11	Federal administration organised in a climate-neutral manner by 2030	1, 2	NECP-R
12	National Hydrogen Strategy	1	NECP-R
13	Voluntary product labels for energy-related products	1, 2	
14	Promotion of energy advice for: Non-residential buildings, installations and systems (EBN)	1, 2	NECP-R
15	Strengthening research for energy efficiency	1, 2, 5	

16	Improving framework conditions for energy efficiency services	1, 2	
17	Energy-efficient urban redevelopment	1, 2	
18	Energy Efficiency Act	1, 2	
	Electricity/energy sector		
19	Coal phase-out in 2038 with accelerated phase-out Lignite phase-out in the Rhineland	1	NECP-R
20	Expansion of renewable energies in line with actual expansion figures and calls for tenders in the EEG	1	NECP-R
21	Combined Heat and Power Act (CHPG)	1	NECP-R
22	Increasingly switch heating networks to renewable energies and unavoidable waste heat – volume of support in accordance with the Federal Ministry of Health and, where appropriate, the Heat Planning Act	1	NECP-R
23	Increase of electrolyser power in accordance with the National Hydrogen Strategy	1	NECP-R
24	Regulatory sandboxes	1, 5	

25	Energy Transition Accompanying Measures	1, 2	NECP-R
	Traffic		
26	Reduction of company car taxation for e-cars by 2030	1	NECP-R
27	Greater emphasis on CO ₂ fare in road transport tax from 2021 onwards	1, 2	NECP-R
28	Reduction of electricity costs – abolition of the EEG surcharge	1	NECP-R
29	Amendment of the distance allowance for long-distance commuters	1	NECP-R
30	Making local public transport more attractive	1	NECP-R
31	Introduction of the German local transport ticket	1	NECP-R
32	Development of cycling infrastructure	1	NECP-R
33	Subsidy for heavy-duty vehicles with climate-friendly propulsion	1	NECP-R

34	Co2- Differentiation of HGV tolls/extension of HGV tolls	1	NECP-R
35	Strengthening the promotion of efficient trailers	1, 2	NECP-R
36	Federal financial aid for shore-side electricity in maritime and inland ports	1	NECP-R
37	CO2emission standards for cars and vans	1	NECP-R
38	CO2 emissionstandards for heavy-duty vehicles	1	NECP-R
39	GHG quota/RED revision (incl. Support programme for advanced biofuels and electricity-based fuels)	1	NECP-R
40	Mixing rate for PtL in aviation and ReFuelEU Aviation	1	NECP-R
41	Scale up refuelling and charging infrastructure for cars and vans	1	NECP-R
42	Scale up refuelling and charging infrastructure for commercial vehicles	1	NECP-R

43	Hybrid electric/climate neutral flight	1	NECP-R
44	Enable transport to automate, connect, liquefied and innovative forms of mobility	1, 2	NECP-R
45	Digital strategy Germany	1, 2	NECP-R
46	Promotion of inland waterway transport (various programmes)	1	NECP-R
47	Climate-neutral ship/maritimes Research programme	1, 5	NECP-R
48	Speeding up planning and implementation of new infrastructure	1	NECP-R
49	Promotion of Corporate Mobility Management (BMM)	1	
50	Modernisation of road transport legislation	1	
	Buildings		
51	Federal Funding for Efficient Buildings (BEG) (modification of heating support under the 65 % rule)	1, 2	NECP-R

52	Support programme for climate-friendly new construction	1, 2	
53	Owner-occupied housing for families	1	
54	Tax incentives for energy renovation of buildings	1, 2	NECP-R
55	Buildings Energy Act	1, 2	NECP-R
56	Federal funding for Serial Rehabilitation	1, 2	NECP-R
57	Example-setting role of federal buildings	1, 2	NECP-R
58	National efficiency label for old heating systems	1, 2	NECP-R
59	Energy certification	1, 2	NECP-R
60	Wooden construction	1	
61	Digital building resources passport	1	
62	Federal support for energy advice for residential buildings	1, 2	NECP-R
63	Further development of the future construction innovation programme	1, 2	NECP-R

64	Modernisation levy	1, 2	
65	Quality Label Sustainable Buildings	1, 2	
66	Levy cap of the BEHG	1, 2	NECP-R
67	Recovery programme and heat pump quality plan	1	
68	Heating optimisation (EnSimiMaV)	1, 2	NECP-R
69	Rehabilitation of municipal facilities (sport, youth, culture)	1, 2	NECP-R
	Electrical equipment and other applications		
70	Minimum efficiency standards – EU Ecodesign Directive	1, 2	NECP-R
71	Energy label – EU Regulation establishing a framework for Energy consumption labelling	1, 2	NECP-R
72	Advice to low-income households (Electricity Saving Check)	1, 2	NECP-R

73	Introduction of smart meters to measure electricity consumption	1, 2	NECP-R
	Industry and commerce, services (GHD)		
74	EU Emissions Trading System (ETS)	1, 2	NECP-R
75	Federal support for energy and resource efficiency in the economy (grant and credit/promotion competition)	1, 2	NECP-R
76	Cold-Climate Directive	1	NECP-R
77	NKI: Municipal directive on investment measures	1	NECP-R
78	Minimum efficiency standards – EU Ecodesign Directive	1, 2	NECP-R
79	Federal support for energy consultancy for non-residential buildings, installations and systems	1, 2	NECP-R
80	Small and medium-sized energy transition and climate change initiative	1	NECP-R
81	Energy Efficiency and Climate Networks Initiative	1, 2	NECP-R

82	Energy-saving meter pilot programme	1, 2	NECP-R
83	Energy audit obligation for non-SMEs	1, 2	NECP-R
84	KfW efficiency programme – production facilities/processes	1, 2	NECP-R
85	Funding programme for decarbonisation in industry	1, 5	NECP-R
86	EU ETS Innovation Fund	1	NECP-R
87	Climate change contracts	1	NECP-R
88	IPCEI Hydrogen in Industrial Production	1	NECP-R
89	Technology Transfer Programme Light Construction	1	NECP-R
90	Industrial Bioeconomy Support Programme	1, 5	
91	Obligation to implement energy management systems	1, 2	NECP-R
92	Industrial processes and product use (fluorinated greenhouse gases)	1	NECP-R
93	EU-F-Gase Regulation 517/2014	1	NECP-R

94	HFC emissions in the EU ETS	1	NECP-R
95	EU MAC Directive 2006/40/EC	1	NECP-R
96	Chemicals Climate Protection Regulation	1	NECP-R
97	Cold-Climate Directive	1	NECP-R
98	Commitment SF ₆	1	NECP-R
	Agriculture		
99	Fermentation of farmyard manure of animal origin	1	
100	Expansion of organic farming	1	NECP-R
101	Energy efficiency in agriculture	1, 2	NECP-R
102	Reducing excess nitrogen and improving nitrogen efficiency	1, 2	NECP-R
103	Reduction of greenhouse gas emissions in livestock farming	1	
104	Research initiative to achieve the 2030 climate targets	1, 5	

	LULUCF		
105	Limiting the use of new land for settlement and transport purposes to less than 30 hectares per day by 2030	1	NECP-R
106	Maintenance and development of humus on arable land	1	
107	Maintenance of permanent grassland	1	
108	Protection of peat soils including reduction of peat use in growing media	1	NECP-R
109	Conservation and sustainable management of forests	1	
110	Rewarding forest ecosystem services	1	
111	Research initiative on climate action in agriculture and forestry	1, 5	
112	Forest Climate Fund	1	
	Management of waste		
113	Landfill Regulation	1	NECP-R

114	Circular Economy Act	1, 2	NECP-R
115	Promotion of landfill ventilation	1	NECP-R
116	Promotion of optimised technologies Collection of landfill gases in municipal waste	1	NECP-R
117	Promoting more climate-friendly Wastewater	1	NECP-R
118	Reduction of food waste	2	NECP-R
119	Regulation on energy security of supply on short-term measures	1, 2, 4	NECP-R
120	Carbon leakage aid	2	
121	Air transport tax	2	NECP-R
122	Tax support for e-mobility	2	NECP-R
123	Security of supply gas	3	NECP-R
124	Network Reserve	3	NECP-R
125	Capacity Reserve	3	NECP-R

126	Monitoring of security of electricity supply	3	NECP-R
127	System stability roadmap	3	NECP-R
128	Monitoring of the security of gas supply	3	NECP-R
129	Cooperations	3	NECP-R
130	Interconnector development projects in the Energy Pipeline Development Act and the Federal Plan Act	4	NECP-R
131	Monitoring and controlling electricity grid expansion projects	4	NECP-R
132	Faster deployment of electricity grids	4	NECP-R
133	Optimisation and modernisation of existing networks	4	NECP-R
134	Network Development Plan (NEP) – Gas	4	
135	Measures in the Action Plan to reduce grid congestion	4	NECP-R
136	Ensuring the flexibility of the energy system	4	

137	Energy research programme and support	5	
138	Strategic Energy Technology Plan (EU SET Plan)	5	
139	Horizon 2020 – the EU Framework Programme for Research and Innovation	5	
140	Strengthening Germany’s energy storage technology research location	5	
141	EU ETS Innovation Fund: Further development of the NER300 programme	5	